Review Paper

About Boeing X-32

Relly Victoria Virgil Petrescu

ARoTMM-IFToMM, Bucharest Polytechnic University, Bucharest (CE), Romania

Abstract: The Boeing X-32 is a demonstration jet designed for the Joint Strike Fighter contest. He lost the Lockheed Martin X-35 demonstrator, which was further developed in the Lockheed Martin F-35 Lightning II. Boeing's competitive advantage has been to provide considerably lower costs of production and lifecycle by minimizing variations between different versions of the JSF. Therefore, the X-32 was designed around a delta wing of the carbon fiber composite. The wing had an opening of 9.15 meters, with a current of 55 degrees on the front edge and could have up to 20,000 kilograms of fuel. The purpose of the large inclination angle was to allow the use of a thick wings section while obtaining limited transonic aerodynamic resistances and a good angle for the corresponding antenna equipment installed in the wing. Wings would be a challenge to be done. The cost competition strategy also led Boeing to choose a direct traction vectoring system for the short-term STOVL landing requirement, as this would require the addition of a traction vectoring module around the main engine. However, this choice requires the engine to be mounted directly behind the cockpit and changing the center of gravity before being ordinarily positioned in the jets of the plane (behind the plane) to allow neutral movement of the attitude. Boeing proposed in the 1960s a supersonic fighter as a gravity motor with vector pushing nozzles, but never surpassed the images published in the aviation week. By comparison, Lockheed's entry showed, if not, a smaller version of the F-22 Raptor stealth fighter. The nickname of X-32, Boeing, was "Monica. " However, another direct lifting selection effect was the chrome-air intake, similar to the Vought F-8 Crusader and LTV A-7 Corsair II. This was necessary to provide sufficient air for the main engine (to provide the force of support) during the zero speed horizon when it could not exploit the ram air pressure. A blow to the effect of this large input was the direct potential visibility of the compressor blades to the radar. Among the possibilities of attenuation were the variable moments designed to lock the received radio waves without adversely affecting the air flow.

Keywords: Boeing, Boeing X-32, Boeing Airpower Teaming System, British Airways, STOVL, Joint Strike Fighter

Introduction

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In 1996, the United States Department of Defense awarded Boeing a four-year contract for the Joint Strike Fighter (JSF) demonstration phase. The goal was to develop tactical for US Air Force, Marina and Marina, Royal Navy and Royal Air Force.

Boeing had to build conceptual demonstration aircraft to provide a community in operating, designing and manufacturing variants; with direct propulsion for short and vertical landing (STOVL), which crosses and crosses vertical and conventional flight; and the ability to approach a carrier at low speeds. Boeing has assembled two conception plans, X-32A and X-32B, at the plant in Palmdale, California.

On September 18, 2000, the X-32A made the first flight from Palmdale to the airbase at Edwards, California. The X-32A demonstrated the conventional take-off and landing characteristics for the Air Force, making 66 flights over four months of testing. The flights validated the aircraft handling qualities for fuel refueling, weapons operations and supersonic flight.

The X-32B made the first flight on March 29, 2001. It carried out 78 four-month test flights, including a transcontinental flight from Edwards to Patuxent River Naval, Md. The aircraft successfully passed from and from STOVL Flight Mode using a straight line to redirect the direction from the nozzle cruise nozzle to the nozzles. The X-32B has demonstrated its ability to move and make vertical landings.

Flight trials concluded in July 2001, demonstrated that actual flight performance was accompanied by computer predictions, based on simulation years, an achievement that has not been achieved so far.

Although not selected for full JSF development, Boeing considered its involvement in the competition as a strategic investment. The program has produced many advances in stealth technology and in designing and manufacturing methods. These achievements have been applied to other Boeing programs, including the F/A-18E/F Super Hornet and the XCA-45A Unmanned Unmanned Vehicle or UCAV (Rulkov *et al.*, 2016; Agarwala, 2016; Babayemi, 2016; Gusti and Semin, 2016; Mohamed *et al.*, 2016; Wessels and Raad, 2016; Rajput *et al.*, 2016; Rea and Ottaviano, 2016; Zurfi and Zhang, 2016a-b; Zheng and Li, 2016; Buonomano *et al.*, 2016 a-b; Faizal *et al.*, 2016; Ascione *et al.*, 2016; Elmeddahi *et al.*, 2016; Calise *et al.*, 2016; Morse *et al.*, 2016; Abouobaida, 2016; Rohit and Dixit, 2016; Kazakov *et al.*, 2016; Alwetaishi, 2016; Riccio *et al.*, 2016a-b; Iqbal, 2016; Hasan and El-Naas, 2016; Al-Hasan and Al-Ghamdi, 2016; Jiang *et al.*, 2016; Sepúlveda, 2016; Martins *et al.*, 2016; Pisello *et al.*, 2016; Jarahi, 2016; Mondal *et al.*, 2016; Mansour, 2016; Qadi *et al.*, 2016b; Campo *et al.*, 2016; Samantaray *et al.*, 2016; Malomar *et al.*, 2016; Rich and Badar, 2016; Hirun, 2016; Bucinell, 2016; Nabilou, 2016b; Barone *et al.*, 2016; Chisari and Bedon, 2016; Bedon and Louter, 2016; Santos and Bedon, 2016; Minghini *et al.*, 2016; Bedon, 2016; Jafari *et al.*, 2016; Chiozzi *et al.*, 2016; Orlando and Benvenuti, 2016; Wang and Yagi, 2016; Obaiys *et al.*, 2016; Ahmed *et al.*, 2016; Jauhari *et al.*, 2016; Syahrullah and Sinaga, 2016; Shanmugam, 2016; Jaber and Bicker, 2016; Wang *et al.*, 2016; Moubarek and Gharsallah, 2016; Amani, 2016; Shruti, 2016; León *et al.*, 2016; Mohseni and Tsavdaridis, 2016; Abu-Lebdeh *et al.*, 2016; Serebrennikov *et al.*, 2016; Budak *et al.*, 2016; Augustine *et al.*, 2016; Jarahi and Seifilaleh, 2016; Nabilou, 2016a; You *et al.*, 2016; Qadi *et al.*, 2016a; Rama *et al.*, 2016; Sallami *et al.*, 2016; Huang *et al.*, 2016; Ali *et al.*, 2016; Kamble and Kumar, 2016; Saikia and Karak, 2016; Zeferino *et al.*, 2016; Pravettoni *et al.*, 2016; Bedon and Amadio, 2016; Chen and Xu, 2016; Mavukkandy *et al.*, 2016; Yeargin *et al.*, 2016; Madani and Dababneh, 2016; Alhasanat *et al.*, 2016; Elliott *et al.*, 2016; Suarez *et al.*, 2016; Kuli *et al.*, 2016; Waters *et al.*, 2016; Montgomery *et al.*, 2016; Lamarre *et al.*, 2016; Petrescu, 2012b; Aversa *et al.*, 2017 a-b, 2016 a-o; Petrescu and Petrescu, 2016, 2015 a-e, 2014 a-i, 2013 a-g, 2012, 2011, 2005 a-d, 2003, 2002 a-b, 2000 a-b, 1997 a-c, 1995 a-b; Petrescu, 2018, 2015 a-b, 2012; Petrescu *et al.*, 2016, 2017 a-d, 2018 a-d; Petrescu and Calautit, 2016 a-b; Daud *et al.*, 2008; Taher *et al.*, 2008; Zulkifli *et al.*, 2008; Pourmahmoud, 2008; Pannirselvam *et al.*, 2008; Ng *et al.*, 2008; El-Tous, 2008; Akhesmeh *et al.*, 2008; Nachiengtai *et al.*, 2008; Moezi *et al.*, 2008; Boucetta, 2008; Darabi *et al.*, 2008; Semin and Bakar, 2008; Al-

Abbas, 2009; Abdullah *et al.*, 2009; Abu-Ein, 2009; Opafunso *et al.*, 2009; Semin *et al.*, 2009a-c; Zulkifli *et al.*, 2009; Ab-Rahman *et al.*, 2009; Abdullah and Halim, 2009; Zotos and Costopoulos, 2009; Feraga *et al.*, 2009; Bakar *et al.*, 2009; Cardu *et al.*, 2009; Bolonkin, 2009a-b; Nandhakumar *et al.*, 2009; Odeh *et al.*, 2009; Lubis *et al.*, 2009; Fathallah and Bakar, 2009; Marghany and Hashim, 2009; Kwon *et al.*, 2010; Aly and Abuelnasr, 2010; Farahani *et al.*, 2010; Ahmed *et al.*, 2010; Kunanoppadon, 2010; Helmy and El-Taweel, 2010; Qutbodin, 2010; Pattanasethanon, 2010; Fen *et al.*, 2011; Thongwan *et al.*, 2011; Theansuwan and Triratanasirichai, 2011; Smadi, 2011; Tourab *et al.*, 2011; Raptis *et al.*, 2011; Momani *et al.*, 2011; Ismail *et al.*, 2011; Anizan *et al.*, 2011; Tsolakis and Raptis, 2011; Abdullah *et al.*, 2011; Kechiche *et al.*, 2011; Ho *et al.*, 2011; Rajbhandari *et al.*, 2011; Aleksic and Lovric, 2011; Kaewnai and Wongwises, 2011; Idarwazeh, 2011; Ebrahim *et al.*, 2012; Abdelkrim *et al.*, 2012; Mohan *et al.*, 2012; Abam *et al.*, 2012; Hassan *et al.*, 2012; Jalil and Sampe, 2013; Jaoude and El-Tawil, 2013; Ali and Shumaker, 2013; Zhao, 2013; El-Labban *et al.*, 2013; Djalel *et al.*, 2013; Nahas and Kozaitis, 2014).

Materials and Methods

The Boeing X-32 (Fig. 1) is a demonstration jet designed for the Joint Strike Fighter contest.

He lost the Lockheed Martin X-35 demonstrator, which was further developed in the Lockheed Martin F-35 Lightning II.

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Fig. 1: Boeing X-32 is a demonstration jet designed for the Joint Strike Fighter contest

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In 1993, the Advanced Defense Research Projects Agency (DARPA) launched the Light Aircraft Project (CALF). The purpose of the project was to develop a design that would allow the replacement of all US Air Force defense and attack aircraft including F-16 Falcon, McDonnell Douglas F/A-18 Hornet and Vertical / Land Flight Vertical (V/STOL) AV-8B Harrier II. At the same time, the Joint Strike Technology (JAST) project was launched. In 1994, the US Congress ordered the two to join the Joint Strike Fighter.

Many companies took part in the first phase of this project, which involved the development of aircraft concepts for deployment to the Department of Defense. On November 16, 1996, Boeing and Lockheed Martin received contracts for each to produce two "Concept Demonstration Aircraft" (CDA). Under the contract, these fighters were required to report departures and landings (CTOL), take-off and landing of the carrier (CV variant), short take-off and vertical landing (STOVL). It is also expected to include ground demonstrations of representative aircraft production systems, such as the Preferred Armament Systems Concept (PWSC).

A major deviation from previous projects has banned companies from using their own money to finance development. Each of them received $ 750 million to produce the two planes-including avionics, software and hardware. This limitation promoted the adoption of low production and assembly techniques and also prevented either Boeing or Lockheed Martin from bankruptcy in an attempt to win such an important competition.

The two X-32 models featured a delta wing design. However, eight months after the demonstration aircraft concept, the JSF's maneuverability and payload requirements were refined at the Navy's request and the Boeing Delta design failed to reach new targets. The engineers changed the design of the double plan (a Pelikan tail), which reduced weight and agility, but it was too late to change the aircraft. The demonstration of Boeing technology was considered sufficient.

On December 14, 1999, Boeing presented both designers at the Palmdale, California plant in front of 5,500 attendees. While the X-32A was due to appear, the launch of the X-32B was a surprise, as the construction of the last aircraft began three months after the first and was completed six weeks after the X-32A. Boeing has awarded STOVL the rapid construction of digital design and assembly methods. After the installation of Pratt & Whitney F119 in April 2000, the X-32A began small and medium taxi tests completed by the end of May.

Due to the heavy design of the X-32 delta, Boeing demonstrated STOVL and supersonic flight in separate configurations, the STOVL configuration requiring removal of the parts from the fighter. The company promised that their conventional design for the production models would not require separate configurations. Instead, the Lockheed Martin X-35 demonstration aircraft was able to move between the STOVL configurations and the mid-flight supersonic configurations.

The first flight of the X-32A (designed for CTOL and transport studies) took place on September 18, 2000, from the Boeing factory in Palmdale to the Edwards Air Base. The aircraft, piloted by Boeing test pilot Fred Knox, took a 670-foot slope before reaching 150 knots (about 280 km/h) at 8:00. Shortly after takeoff, a small hydraulic leak was discovered and the flight was cut from expectations from 30 or 40 minutes to 20 min. According to Knox, the tracking plan F/A-18 has called for "a lot of post-burners" to keep up with the X-32 in the initial stages. During the flight, the aircraft reached 3000 meters, reaching a speed of 200 knots (370 km/h, 230 mph) and reached an attack angle of 13°. Despite the shortened flight, approximately 80% of the planned test points were obtained. It was fed by a conventional F-22 derivative called F119-PW-614C.

Results

On March 29, 2001, the X-32B STOVL version made its first flight. The flight lasted 50 minutes when the plane flew from Palmdale to Edwards AFB. The flight was initially scheduled for the third quarter of 2000. A modified version of the 614C, known as the F119-PW-614S, powered the STOVL. In normal flight, the 614S was configured as a conventional turbofan after firing. However, in STOVL mode, a butterfly valve removes the exhaust gases from the base stream to a pair of traction vector nozzles located near the center of gravity of the airplane. Prior to these nozzles, a jet screen nozzle provided a cold bypass air sheet to minimize hot gas recirculation. Two pairs of pipes fed the rear nozzles and the front nozzles. The post-burner was not lit, with no gas flow, during the ascension. The X-32B made the STOVL flight in the same way as the AV-8B Harrier II with vector drainage. A smooth transition (between STOVL and Normal modes) was achieved by maintaining a consistent engine match, facilitated by the

control system algorithm, maintaining an effective area of stationary fixed nozzles. Thus, the engine did not know that different nozzles are open and closed to complete the transition.

In principle, the F119-PW-614S engine was a Direct Lift engine, while the Lockheed Martin STOVL team used a more complex and risky alternative, known as the F119-PW-611, which includes a remote fan with the shaft, engine. However, it generated more lifting force than possible only with direct exhaust gas. A successful design would have a higher payload and thus a longer range than a vectorized turbofan simply.

Verification of flights of two companies continued until July 2001.

On October 26, 2001, the Department of Defense announced that Lockheed Martin X-35 won the JSF contest (Fig. 2). The X-35 will be developed in the Lockheed Martin F-35 Lightning II.

The loss of the JSF contract to Lockheed Martin in 2001 was a major blow to Boeing, representing the most important international combat aircraft project in the 1960s and 1970s, which led to Falcon Fighting F-16 and F/A-18 Viespe. At that time, JSF production was estimated at anywhere from 3,000 to 5,000. Prior to awarding the contract, many MPs pushed the idea of keeping their competitors at the loss of subcontractors; however, the "winner takes everything" principle has not changed. However, Boeing believes that its X-32 activity is a strategic investment, generating important technologies that it embraced in the Boeing F/A-18E / F Super Hornet study.

The Joint Strike Fighter (JSF) is a development and acquisition program designed to replace a wide range of existing aircraft for wrestling, strikes and fights for the United States, Britain, Turkey, Italy, Canada, Australia, the Netherlands and the Allies. After a competition between the Boeing X-32 and the Lockheed Martin X-35, a final design was chosen based on the X-35. This is the F-35 Lightning II, which will replace the different tactical aircraft, including F-16, A-10, F/A-18A-D, AV-8B and British Harrier GR7, GR9 and Tornado GR4. The estimated average annual cost of this program is $ 12. 5 billion, estimated at $ 1. 1 trillion of the program's life cycle.

The JSF program was the result of the merger between Common Journey Lighter Fighter (CALF) and Joint Alert Strike (JAST) projects. The merged project continued under the name "JAST" for Engineering, Production and Development (EMD), where the project became Joint Strike Fighter.

CALF was a DARPA program for developing a STOVL Strike Fighter (SSF) for the US Maritime Corps and F-16 Fighter Replacement. The US Air Force jumped over the Agil Falcon F-16 in the late 1980s, essentially an F-16 increase and continued to interfere with other models. In 1992, the Navy and Air Force agreed to jointly develop an accessible fighter, known as Advanced Short Takeoff and Vertical Landing (ASTOVL). The CALF project was chosen after Paul Bevilaqua convinced the Air Force that the concept of his team (if stripped of his lift system) had potential as a complement to the F-22 Raptor. In a way, the F-35B gave birth to the F-35A, not the other way around.

Fig. 2: Boeing JSF production mockup (Note the separate wing and tail planes)

The Joint Strike Technology Program (JAST) was created in 1993, implementing one of the recommendations of a state-of-the-art US Department of Defense (DoD) review to include the United States Navy in the Common Strike Fighter program. The review also led the Pentagon to continue the F-22 Raptor and F/A-18E/F Super Hornet programs, cancel the A/FX programs and reduce F-16 and F/A-18C/D 1994 for aviation; sensors to replace several US and UK planes with interrupted aircraft; most products would replace the F-16. Merrill McPeak, the former head of the United States Air Force Staff, complained that Les Aspin's decision to force all three services to use a single aircraft significantly increased the costs and difficulties of the project.

In November 1995, the UK signed a Memorandum of Understanding to become a formal partner and agreed to pay $ 200 million or 10% of the demonstration phase of the concept.

In 1997, the Canadian National Defense Department signed the Concept demonstration phase with a $ 10 million investment. This investment has allowed Canada to participate in a rigorous and rigorous competitive process in which Boeing and Lockheed Martin have developed and competed for their prototypes.

Studies supporting JAST/JSF began in 1993 and led to STOVL presentations at DOD by McDonnell Douglas, Northrop Grumman, Lockheed Martin and Boeing.

McDonnell Douglas proposed a plan powered by a reheated turbine with a remote gas fan to lift the elevator in STOVL mode. Later, General Electric made a ground demonstration of this engine configuration.

The Northrop Grumman engine featured an amplified auxiliary lifting power of a dry turbofan engine equipped with a pair of vector pushing nozzles.

We did not have this engine configuration to drive the F135-PW-600, which operates the JSF F-35B production aircraft.

Boeing opposed growth in force. They proposed an aircraft powered by a re-heated turbocharger that could be reconfigured (in STOVL mode) in a direct lifting engine with a pair of traction vector nozzles located near the center of gravity of the aircraft. This led to the F119-PW-614S that powered the X-32B JSF demonstrator.

Two prototype development contracts were awarded on November 16, 1996, one at Lockheed Martin and Boeing. Each company produces two take-offs and landing (CTOL) take-off and landing (CV version) take-off and landing (STOVL). McDonnell Douglas's request was partially rejected due to the complexity of his design. Lockheed Martin and Boeing received $ 750 million to develop the concept of demonstration concept and to define a preferred weapon system (PWSC). It's not me, I am, also in 1996, the British Defense Ministry launched the Future Carrier Borne Aircraft project. This

program sought a replacement for the Sea Harrier (and later Harrier GR7); Joint Strike Fighter was selected in January 2001.

During the definition, two Lockheed Martin X-35A plans (which were later converted to X-35B) and X-35C with larger wings were moved. Probably the most persuasive demonstration of the X-35's capacity as the Joint Strike Fighter students' flight studies where the STOVL X-35Bs took off in less than 150 meters, were supersonic and landed vertically - that Boeing's entrance failed.

The development and demonstration agreement of the system was granted on October 26, 2001, to Lockheed Martin, whose model X-35 beat the Boeing X-32. One of the main reasons for this choice seems to be how to get the STOVL flight and the Department of Defense said that high-performance ventilation systems deserve additional risk. When it was close to the ground, the Boeing X-32 suffered from the hot air problem in the exhaust gases that returned to the main engine, causing axle weakening and overheating of the engine.

Discussion

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The United States Department of Defense and William Bach, the British Defense Minister, said the X-35 has consistently outperformed the X-32, although both have met or exceeded the requirements.

The development of the JSF will be jointly funded by the United States, Britain, Italy, the Netherlands, Canada, Turkey, Australia, Norway and Denmark.

Lockheed Martin X-35 will become the basis of the F-35 Lightning II, currently in production. On April 6, 2009, US Secretary of Defense Robert Gates announced that the US would buy a total of 2,443 JSFs.

On February 1, 2010, Secretary of Defense Robert M. Gates announced that due to delays and other issues related to the JSF development program, he removed Major General David R. Heinz from commissioning the program and has retained $ 614 million in bonuses from Lockheed Martin. On February 16, 2010, Deputy Secretary of Defense Bill Lynn announced that the program would be postponed by one year. Estimates suggest that overrun could increase program costs up to $ 388 billion, up 50% from baseline. Many of the

program's financial and technical complications result from the JSF Marine version, capable of taking off and landing vertically.

On March 11, 2010, the US Senate Commission for Armed Services investigated the progress of the JSF program during a meeting with Pentagon officials, highlighting the costs of a Nunn-McCurdy trial. According to the Government Accountability Office, the F-35A cost increased from USD 50 million in 2002, from 69 million USD in 2007 to 74 million in 2010, all measured in 2002.

Canada has revised its commitment to the project in December 2012 due to cost overruns. The decision was taken following a report by the KPMG audit firm that showed that the purchase by Canada would cost 45 billion dollars for 42 years. Defense Minister Peter MacKay announced Canada's plan to buy the F-35 in 2010, saying that "we have not been able to make a full assessment of all available aircraft," said Rona Ambrose, the purchase price was 9 billion but did not provide estimates of operating costs. During a 2011 election campaign, the Conservatives said the total cost of more than 20 years would be 16 billion dollars.

Concerns about F-35 performance were partly due to RAND Corporation's simulation reports, in which three Sukhoi fighters in Russia defeated six F-22 refusals.

As a result of these press reports, Australian Defense Minister Joel Fitzgibbon requested official information from the Australian Defense Department on simulation. This information indicated that the simulation reports were inaccurate and did not compare the performance of the F-35 with those of other plans.

Andrew Hoehn, director of the RAND project, made the following statement: "Recently, Australian media accusations from RAND Corporation's game analysts have made no analysis of the war game with the F-35 Joint Strike Fighter and the game will not try to provide details explaining the air-to-air battle. " The RAND game and the RAND game do not compare the combat qualities of certain combat planes.

Moreover, it is said that Maj. Richard Koch, head of the US Department of Aeronautics Control, said: "I found myself in a cool sweat that the F-35 only goes with two-speed guns," says an extremely skeptical source. The F-35 would be 400% more efficient than the designers.

The experience of the JSF program has led to a more conservative and open schedule for upcoming vertical lifts.

Conclusion

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Acknowledgement

Funding Information

Ethics

Author declares that are not ethical issues that may arise after the publication of this manuscript. This article is original and contains unpublished material.

References

Abam, F.I., I.U. Ugot and D.I. Igbong, 2012. Performance analysis and components irreversibilities of a (25 MW) gas turbine power plant modeled with a spray cooler. Am. J. Eng. Applied Sci., 5: 35-41. DOI: 10.3844/ajeassp.2012.35.41

Abdelkrim, H., S.B. Othman, A.K.B. Salem and S.B. Saoud, 2012. Dynamic partial reconfiguration contribution on system on programmable chip architecture for motor drive implementation. Am. J. Eng. Applied Sci., 5: 15-24.
DOI: 10.3844/ajeassp.2012.15.24

Abdullah, H. and S.A. Halim, 2009. Electrical and magnetoresistive studies nd doped on La-Ba-Mn-O3 manganites for low-field sensor application. Am. J. Eng. Applied Sci., 2: 297-303.
DOI: 10.3844/ajeassp.2009.297.303

Abdullah, M., A.F.M. Zain, Y.H. Ho and S. Abdullah, 2009. TEC and scintillation study of equatorial ionosphere: A month campaign over sipitang and parit raja stations. Malaysia, Am. J. Eng. Applied Sci., 2: 44-49. DOI: 10.3844/ajeassp.2009.44.49

Abdullah, M.Z., A. Saat and Z. Hamzah, 2011. Optimization of energy dispersive x-ray fluorescence spectrometer to analyze heavy metals in moss samples. Am. J. Eng. Applied Sci., 4: 355-362.
DOI: 10.3844/ajeassp.2011.355.362

Abouobaida, H., 2016. Robust and efficient controller to design a standalone source supplied DC and AC load powered by photovoltaic generator. Am. J. Eng. Applied Sci., 9: 894-901.
DOI: 10.3844/ajeassp.2016.894.901

Ab-Rahman, M.S., H. Guna, M.H. Harun, S.D. Zan and K. Jumari, 2009. Cost-effective fabrication of self-made 1×12 polymer optical fiber-based optical splitters for automotive application. Am. J. Eng. Applied Sci., 2: 252-259. DOI: 10.3844/ajeassp.2009.252.259

Abu-Ein, S., 2009. Numerical and analytical study of exhaust gases flow in porous media with applications to diesel particulate filters. Am. J. Eng. Applied Sci., 2: 70-75. DOI: 10.3844/ajeassp.2009.70.75

Abu-Lebdeh, T.M., G.P. León, S.A. Hamoush, R.D. Seals and V.E. Lamberti, 2016. Gas atomization of molten metal: part II. Applicat. Am. J. Eng. Applied Sci., 9: 334-349. DOI: 10.3844/ajeassp.2016.334.349

Agarwala, S., 2016. A perspective on 3D bioprinting technology: Present and future, Am. J. Eng. Applied Sci., 9: 985-990.
DOI: 10.3844/ajeassp.2016.985.990

Ahmed, M., R. Khan, M. Billah and S. Farhana, 2010. A novel navigation algorithm for hexagonal hexapod robot. Am. J. Eng. Applied Sci., 3: 320-327. DOI: 10.3844/ajeassp.2010.320.327

Ahmed, R.M. Khan, H. Haque and H. Rahman, 2016. An approach to develop a dynamic job shop scheduling by fuzzy rule-based system and comparative study with the traditional priority rules. Am. J. Eng. Applied Sci., 9: 202-212. DOI: 10.3844/ajeassp.2016.202.212

Akhesmeh, S., N. Pourmahmoud and H. Sedgi, 2008. Numerical study of the temperature separation in the ranque-hilsch vortex tube, Am. J. Eng. Applied Sci., 1: 181-187. DOI: 10.3844/ajeassp.2008.181.187

Al-Abbas, I.K., 2009. Reduced order models of a current source inverter induction motor drive. Am. J. Eng. Applied Sci., 2: 39-43. DOI: 10.3844/ajeassp.2009.39.43

Aleksic, S. and A. Lovric, 2011. Energy consumption and environmental implications of wired access networks. Am. J. Eng. Applied Sci., 4: 531-539. DOI: 10.3844/ajeassp.2011.531.539

Al-Hasan, M.I. and A.S. Al-Ghamdi, 2016. Energy balance for a diesel engine operates on a pure biodiesel, diesel fuel and biodiesel-diesel blends. Am. J. Eng. Applied Sci., 9: 458-465. DOI: 10.3844/ajeassp.2016.458.465

Alhasanat, M.B., A.N.A. Qadi, O.A.A. Khashman and A. Dahamsheh, 2016. Scanning electron microscopic evaluation of self-compacting concrete spalling at elevated temperatures. Am. J. Eng. Applied Sci., 9: 119-127. DOI: 10.3844/ajeassp.2016.119.127

Ali, G.A.M., O. Fouad and S.A. Makhlouf, 2016. Electrical properties of cobalt oxide/silica nanocomposites obtained by sol-gel technique. Am. J. Eng. Applied Sci., 9: 12-16. DOI: 10.3844/ajeassp.2016.12.16

Ali, K.S. and J.L. Shumaker, 2013. Hardware in the loop simulator for multi-agent unmanned aerial vehicles environment. Am. J. Eng. Applied Sci., 6: 172-177. DOI: 10.3844/ajeassp.2013.172.177

Alwetaishi, M.S., 2016. Impact of building function on thermal comfort: A review paper. Am. J. Eng. Applied Sci., 9: 928-945. DOI: 10.3844/ajeassp.2016.928.945

Aly, W.M. and M.S. Abuelnasr, 2010. Electronic design automation using object oriented electronics, Am. J. Eng. Applied Sci., 3: 121-127. DOI: 10.3844/ajeassp.2010.121.127

Amani, N., 2016. Design and implementation of optimum management system using cost evaluation and financial analysis for prevention of building failure. Am. J. Eng. Applied Sci., 9: 281-296. DOI: 10.3844/ajeassp.2016.281.296

Anizan, S., K. Yusri, C.S. Leong, N. Amin, S. Zaidi and K. Sopian, 2011. Effects of the contact resistivity variations of the screen-printed silicon solar cell. Am. J. Eng. Applied Sci., 4: 328-331. DOI: 10.3844/ajeassp.2011.328.331

Ascione, F., N. Bianco, R.F.D. Masi, F.D. Rossi, C.D. Stasio and G.P. Vanoli, 2016. Energy audit of health care facilities: Dynamic simulation of energy performances and energy-oriented refurbishment of system and equipment for microclimatic control. Am. J. Eng. Applied Sci., 9: 814-834. DOI: 10.3844/ajeassp.2016.814.834

Augustine, A., R.D. Prakash, R. Xavier and M.C. Parassery, 2016. Review of signal processing techniques for detection of power quality events. Am. J. Eng. Applied Sci., 9: 364-370. DOI: 10.3844/ajeassp.2016.364.370

Aversa, R., D. Parcesepe, R.V. Petrescu, G. Chen and F. I.T. Petrescu et al., 2016b. Glassy amorphous metal injection molded induced morphological defects. Am. J. Applied Sci., 13: 1476-1482.

Aversa, R., D. Parcesepe, R.V.V. Petrescu, F. Berto and G. Chen et al., 2017b. Process ability of bulk metallic glasses. Am. J. Applied Sci., 14: 294-301.

Aversa, R., E. M. Buzea, R. V. Petrescu, A. Apicella and M. Neacsa et al., 2016e. Present a mechatronic system having able to determine the concentration of carotenoids. Am. J. Eng. Applied Sci., 9: 1106-1111.

Aversa, R., F. Tamburrino, R.V. Petrescu, F.I.T. Petrescu and M. Artur et al., 2016d. Biomechanically inspired shape memory effect machines driven by muscle like acting NiTi alloys. Am. J. Applied Sci., 13: 1264-1271.

Aversa, R., F.I.T. Petrescu, R.V. Petrescu and A. Apicella, 2016a. Biomimetic FEA bone modeling for customized hybrid biological prostheses development. Am. J. Applied Sci., 13: 1060-1067. DOI: 10.3844/ajassp.2016.1060.1067

Aversa, R., F.I.T. Petrescu, R.V. Petrescu and A. Apicella, 2016o. Flexible stem trabecular prostheses. Am. J. Eng. Applied Sci., 9: 1213-1221.

Aversa, R., R.V. Petrescu, A. Apicella and F.I.T. Petrescu, 2016i. Mitochondria are naturally micro robots-a review. Am. J. Eng. Applied Sci., 9: 991-1002.

Aversa, R., R.V. Petrescu, A. Apicella and F.I.T. Petrescu, 2016j. We are addicted to vitamins C and E-A review. Am. J. Eng. Applied Sci., 9: 1003-1018.

Aversa, R., R.V. Petrescu, A. Apicella and F.I.T. Petrescu, 2016k. Physiologic human fluids and swelling behavior of hydrophilic biocompatible hybrid ceramo-polymeric materials. Am. J. Eng. Applied Sci., 9: 962-972.

Aversa, R., R.V. Petrescu, A. Apicella and F.I.T. Petrescu, 2016l. One can slow down the aging through antioxidants. Am. J. Eng. Applied Sci., 9: 1112-1126.

Aversa, R., R.V. Petrescu, A. Apicella and F.I.T. Petrescu, 2016m. About homeopathy or ≪Similia similibus curentur. Am. J. Eng. Applied Sci., 9: 1164-1172.

Aversa, R., R.V. Petrescu, A. Apicella and F.I.T. Petrescu, 2016n. The basic elements of life's. Am. J. Eng. Applied Sci., 9: 1189-1197.

Aversa, R., R.V. Petrescu, F.I.T. Petrescu and A. Apicella, 2016c. Smart-factory: Optimization and process control of composite centrifuged pipes. Am. J. Applied Sci., 13: 1330-1341.

Aversa, R., R.V. Petrescu, F.I.T. Petrescu and A. Apicella, 2016h Biomimetic and evolutionary design driven innovation in sustainable products development. Am. J. Eng. Applied Sci., 9: 1027-1036.

Aversa, R., R.V. Petrescu, R. Sorrentino, F.I.T. Petrescu and A. Apicella, 2016f. Hybrid ceramo-polymeric nanocomposite for biomimetic scaffolds design and preparation. Am. J. Eng. Applied Sci., 9: 1096-1105.

Aversa, R., R.V.V. Petrescu, A. Apicella and F.I.T. Petrescu, 2017a. Nano-diamond hybrid materials for structural biomedical application. Am. J. Biochem. Biotechnol.

Aversa, R., V. Perrotta, R.V. Petrescu, C. Misiano and F.I.T. Petrescu *et al.*, 2016g. From structural colors to super-hydrophobicity and achromatic transparent protective coatings: Ion plating plasma assisted TiO2 and SiO2 Nano-film deposition. Am. J. Eng. Applied Sci., 9: 1037-1045.

Babayemi, A.K., 2016. Thermodynamics, Non-linear isotherms, statistical modeling and optimization of phosphorus adsorption from wastewater. Am. J. Eng. Applied Sci., 9: 1019-1026. DOI: 10.3844/ajeassp.2016.1019.1026

Bakar, R.A., M.K. Mohammed and M.M. Rahman, 2009. Numerical study on the performance characteristics of hydrogen fueled port injection internal combustion engine. Am. J. Eng. Applied Sci., 2: 407-415. DOI: 10.3844/ajeassp.2009.407.415

Barone, G., A. Buonomano, C. Forzano and A. Palombo, 2016. WLHP systems in commercial buildings: A case study analysis based on a dynamic simulation approach. Am. J. Eng. Applied Sci., 9: 659-668. DOI: 10.3844/ajeassp.2016.659.668

Bedon, C. and C. Amadio, 2016. A unified approach for the shear buckling design of structural glass walls with non-ideal restraints. Am. J. Eng. Applied Sci., 9: 64-78. DOI: 10.3844/ajeassp.2016.64.78

Bedon, C. and C. Louter, 2016. Finite-element numerical simulation of the bending performance of post-tensioned structural glass beams with adhesively bonded CFRP tendons. Am. J. Eng. Applied Sci., 9: 680-691. DOI: 10.3844/ajeassp.2016.680.691

Bedon, C., 2016. Review on the use of FRP composites for facades and building skins. Am. J. Eng. Applied Sci., 9: 713-723. DOI: 10.3844/ajeassp.2016.713.723

Bolonkin, A., 2009a. Femtotechnology: Nuclear matter with fantastic properties. Am. J. Eng. Applied Sci., 2: 501-514. DOI: 10.3844/ajeassp.2009.501.514

Bolonkin, A., 2009b. Converting of matter to nuclear energy by ab-generator. Am. J. Eng. Applied Sci., 2: 683-693. DOI: 10.3844/ajeassp.2009.683.693

Boucetta, A., 2008. Vector control of a variable reluctance machine stator and rotor discs imbricates. Am. J. Eng. Applied Sci., 1: 260-265. DOI: 10.3844/ajeassp.2008.260.265

Bucinell, R.B., 2016. Stochastic model for variable amplitude fatigue induced delamination growth in graphite/epoxy laminates. Am. J. Eng. Applied Sci., 9: 635-646. DOI: 10.3844/ajeassp.2016.635.646

Budak, S., Z. Xiao, B. Johnson, J. Cole and C. Casselberry, 2016. Highly-efficient advanced thermoelectric devices from different multilayer thin films. Am. J. Eng. Applied Sci., 9: 356-363. DOI: 10.3844/ajeassp.2016.356.363

Buonomano, A., F. Calise and M. Vicidomini, 2016a. A novel prototype of a small-scale solar power plant: Dynamic simulation and thermoeconomic analysis, Am. J. Eng. Applied Sci., 9: 770-788. DOI: 10.3844/ajeassp.2016.770.788

Buonomano, A., F. Calise, M. D. d'Accadia, R. Vanoli and M. Vicidomini, 2016b. Simulation and experimental analysis of a demonstrative solar heating and cooling plant installed in Naples (Italy). Am. J. Eng. Applied Sci., 9: 798-813. DOI: 10.3844/ajeassp.2016.798.813

Calise, F., M. D. dâ' Accadia, L. Libertini, E. Quiriti and M. Vicidomini, 2016. Dynamic simulation and optimum operation strategy of a trigeneration system serving a hospital. Am. J. Eng. Applied Sci., 9: 854-867. DOI: 10.3844/ajeassp.2016.854.867

Campo, T., M. Cotto, F. Marquez, E. Elizalde and C. Morant, 2016. Graphene synthesis by plasma-enhanced CVD growth with ethanol. Am. J. Eng. Applied Sci., 9: 574-583. DOI: 10.3844/ajeassp.2016.574.583

Cardu, M., P. Oreste and T. Cicala, 2009. Analysis of the tunnel boring machine advancement on the bologna-florence railway link. Am. J. Eng. Applied Sci., 2: 416-420. DOI: 10.3844/ajeassp.2009.416.420

Chen, G. and L. Xu, 2016. A general strategy to enhance upconversion luminescence in rare-earth-ion-doped oxide nanocrystals. Am. J. Eng. Applied Sci., 9: 79-83. DOI: 10.3844/ajeassp.2016.79.83

Chiozzi, A., G. Milani, N. Grillanda and A. Tralli, 2016. An adaptive procedure for the limit analysis of FRP reinforced masonry vaults and applications. Am. J. Eng. Applied Sci., 9: 735-745. DOI: 10.3844/ajeassp.2016.735.745

Chisari, C. and C. Bedon, 2016. Multi-objective optimization of FRP jackets for improving the seismic response of reinforced concrete frames. Am. J. Eng. Applied Sci., 9: 669-679. DOI: 10.3844/ajeassp.2016.669.679

Darabi, A., S.A. Soleamani and A. Hassannia, 2008. Fuzzy based digital automatic voltage regulator of a synchronous generator with unbalanced loads. Am. J. Eng. Applied Sci., 1: 280-286. DOI: 10.3844/ajeassp.2008.280.286

Daud, H., N. Yahya, A.A. Aziz and M.F. Jusoh, 2008. Development of wireless electric concept powering electrical appliances. Am. J. Eng. Applied Sci., 1: 12-15. DOI: 10.3844/ajeassp.2008.12.15

Djalel, D., M. Mourad and H. Labar, 2013. New approach of electromagnetic fields of the lightning discharge. Am. J. Eng. Applied Sci., 6: 369-383. DOI: 10.3844/ajeassp.2013.369.383

Ebrahim, N.A., S. Ahmed, S.H.A. Rashid and Z. Taha, 2012. Technology use in the virtual R and D Teams. Am. J. Eng. Applied Sci., 5: 9-14. DOI: 10.3844/ajeassp.2012.9.14

El-Labban, H.F., M. Abdelaziz and E.R.I. Mahmoud, 2013. Modification of carbon steel by laser surface melting: Part I: Effect of laser beam travelling speed on microstructural features and surface hardness. Am. J. Eng. Applied Sci., 6: 352-359. DOI: 10.3844/ajeassp.2013.352.359

Elliott, A., S. AlSalihi, A.L. Merriman and M.M. Basti, 2016. Infiltration of nanoparticles into porous binder jet printed parts. Am. J. Eng. Applied Sci., 9: 128-133. DOI: 10.3844/ajeassp.2016.128.133

Elmeddahi, Y., H. Mahmoudi, A. Issaadi, M.F.A. Goosen and R. Ragab, 2016b. Evaluating the effects of climate change and variability on water resources: A case study of the cheliff basin in Algeria, Am. J. Eng. Applied Sci., 9: 835-845. DOI: 10.3844/ajeassp.2016.835.845

El-Tous, Y., 2008. Pitch angle control of variable speed wind turbine. Am. J. Eng. Applied Sci., 1: 118-120. DOI: 10.3844/ajeassp.2008.118.120

Faizal, A., S. Mulyono, R. Yendra and A. Fudholi, 2016. Design Maximum Power Point Tracking (MPPT) on photovoltaic panels using Fuzzy logic method. Am. J. Eng. Applied Sci., 9: 789-797. DOI: 10.3844/ajeassp.2016.789.797

Farahani, A.S., N.M. Adam and M.K.A. Ariffin, 2010. Simulation of airflow and aerodynamic forces acting on a rotating turbine ventilator. Am. J. Eng. Applied Sci., 3: 159-170. DOI: 10.3844/ajeassp.2010.159.170

Fathallah, A.Z.M. and R.A. Bakar, 2009. Prediction studies for the performance of a single cylinder high speed spark ignition linier engine with spring mechanism as return cycle. Am. J. Eng. Applied Sci., 2: 713-720. DOI: 10.3844/ajeassp.2009.713.720

Fen, Y.W., W.M.M. Yunus, M.M. Moksin, Z.A. Talib and N.A. Yusof, 2011. Optical properties of crosslinked chitosan thin film with glutaraldehyde using surface plasmon resonance technique. Am. J. Eng. Applied Sci., 4: 61-65. DOI: 10.3844/ajeassp.2011.61.65

Feraga, C.E., A. Moussaoui, A. Bouldjedri and A. Yousfi, 2009. Robust position controller for a permanent magnet synchronous actuator. Am. J. Eng. Applied Sci., 2: 388-392. DOI: 10.3844/ajeassp.2009.388.392

Gusti, A.P. and Semin, 2016. The effect of vessel speed on fuel consumption and exhaust gas emissions. Am. J. Eng. Applied Sci., 9: 1046-1053. DOI: 10.3844/ajeassp.2016.1046.1053

Hasan, S. and M.H. El-Naas, 2016. Optimization of a combined approach for the treatment of carbide slurry and capture of CO2. Am. J. Eng. Applied Sci., 9: 449-457. DOI: 10.3844/ajeassp.2016.449.457

Hassan, M., H. Mahjoub and M. Obed, 2012. Voice-based control of a DC servo motor. Am. J. Eng. Applied Sci., 5: 89-92. DOI: 10.3844/ajeassp.2012.89.92

Helmy, A.K. and G.S. El-Taweel, 2010. Neural network change detection model for satellite images using textural and spectral characteristics. Am. J. Eng. Applied Sci., 3: 604-610. DOI: 10.3844/ajeassp.2010.604.610

Hirun, W., 2016. Evaluation of interregional freight generation modelling methods by using nationwide commodity flow survey data. Am. J. Eng. Applied Sci., 9: 625-634. DOI: 10.3844/ajeassp.2016.625.634

Ho, C.Y.F., B.W.K. Ling, S.G. Blasi, Z.W. Chi and W.C. Siu, 2011. Single step optimal block matched motion estimation with motion vectors having arbitrary pixel precisions. Am. J. Eng. Applied Sci., 4: 448-460. DOI: 10.3844/ajeassp.2011.448.460

Huang, B., S.H. Masood, M. Nikzad, P.R. Venugopal and A. Arivazhagan, 2016. Dynamic mechanical properties of fused deposition modelling processed polyphenylsulfone material. Am. J. Eng. Applied Sci., 9: 1-11. DOI: 10.3844/ajeassp.2016.1.11

Idarwazeh, S., 2011. Inverse discrete fourier transform-discrete fourier transform techniques for generating and receiving spectrally efficient frequency division multiplexing signals. Am. J. Eng. Applied Sci., 4: 598-606. DOI: 10.3844/ajeassp.2011.598.606

Iqbal, M., 2016. An overview of Energy Loss Reduction (ELR) software used in pakistan by WAPDA for calculating transformer overloading, line losses and energy losses. Am. J. Eng. Applied Sci., 9: 442-448. DOI: 10.3844/ajeassp.2016.442.448

Ismail, M.I.S., Y. Okamoto, A. Okada and Y. Uno, 2011. Experimental investigation on micro-welding of thin stainless steel sheet by fiber laser. Am. J. Eng. Applied Sci., 4: 314-320. DOI: 10.3844/ajeassp.2011.314.320

Jaber, A.A. and R. Bicker, 2016. Industrial robot fault detection based on statistical control chart. Am. J. Eng. Applied Sci., 9: 251-263. DOI: 10.3844/ajeassp.2016.251.263

Jafari, N., A. Alsadoon, C.P. Withana, A. Beg and A. Elchouemi, 2016. Designing a comprehensive security framework for smartphones and mobile devices. Am. J. Eng. Applied Sci., 9: 724-734. DOI: 10.3844/ajeassp.2016.724.734

Jalil, M.I.A. and J. Sampe, 2013. Experimental investigation of thermoelectric generator modules with different technique of cooling system. Am. J. Eng. Applied Sci., 6: 1-7. DOI: 10.3844/ajeassp.2013.1.7

Jaoude, A.A. and K. El-Tawil, 2013. Analytic and nonlinear prognostic for vehicle suspension systems. Am. J. Eng. Applied Sci., 6: 42-56. DOI: 10.3844/ajeassp.2013.42.56

Jarahi, H. and S. Seifilaleh, 2016. Rock fall hazard zonation in haraz highway. Am. J. Eng. Applied Sci., 9: 371-379. DOI: 10.3844/ajeassp.2016.371.379

Jarahi, H., 2016. Probabilistic seismic hazard deaggregation for karaj city (Iran). Am. J. Eng. Applied Sci., 9: 520-529. DOI: 10.3844/ajeassp.2016.520.529

Jauhari, K., A. Widodo and I. Haryanto, 2016. Identification of a machine tool spindle critical frequency through modal and imbalance response analysis. Am. J. Eng. Applied Sci., 9: 213-221. DOI: 10.3844/ajeassp.2016.213.221

Jiang, J., Q. Chen and S. Nimbalkar, 2016. Field data based method for predicting long-term settlements. Am. J. Eng. Applied Sci., 9: 466-476. DOI: 10.3844/ajeassp.2016.466.476

Kaewnai, S. and S. Wongwises, 2011. Improvement of the runner design of francis turbine using computational fluid dynamics. Am. J. Eng. Applied Sci., 4: 540-547. DOI: 10.3844/ajeassp.2011.540.547

Kamble, V.G. and N.L. Kumar, 2016. Fabrication and tensile property analysis of polymer matrix composites of graphite and silicon carbide as fillers. Am. J. Eng. Applied Sci., 9: 17-30. DOI: 10.3844/ajeassp.2016.17.30

Kazakov, V.V., V.I. Yusupov, V.N. Bagratashvili, A.I. Pavlikov and V.A. Kamensky, 2016. Control of bubble formation at the optical fiber tip by analyzing ultrasound acoustic waves. Am. J. Eng. Applied Sci., 9: 921-927. DOI: 10.3844/ajeassp.2016.921.927

Kechiche, O.B.H.B., H.B.A. Sethom, H. Sammoud and I.S. Belkhodja, 2011. Optimized high-frequency signal injection based permanent magnet synchronous motor rotor position estimation applied to washing machines. Am. J. Eng. Applied Sci., 4: 390-399. DOI: 10.3844/ajeassp.2011.390.399

Kuli, I., T.M. Abu-Lebdeh, E.H. Fini and S.A. Hamoush, 2016. The use of nano-silica for improving mechanical properties of hardened cement paste. Am. J. Eng. Applied Sci., 9: 146-154. DOI: 10.3844/ajeassp.2016.146.154

Kunanoppadon, J., 2010. Thermal efficiency of a combined turbocharger set with gasoline engine. Am. J. Eng. Applied Sci., 3: 342-349. DOI: 10.3844/ajeassp.2010.342.349

Kwon, S., Y. Tani, H. Okubo and T. Shimomura, 2010. Fixed-star tracking attitude control of spacecraft using single-gimbal control moment gyros. Am. J. Eng. Applied Sci., 3: 49-55. DOI: 10.3844/ajeassp.2010.49.55

Lamarre, A., E.H. Fini and T.M. Abu-Lebdeh, 2016. Investigating effects of water conditioning on the adhesion properties of crack sealant. Am. J. Eng. Applied Sci., 9: 178-186. DOI: 10.3844/ajeassp.2016.178.186

León, G.P., V.E. Lamberti, R.D. Seals, T.M. Abu-Lebdeh and S.A. Hamoush, 2016. Gas atomization of molten metal: Part I numerical modeling conception. Am. J. Eng. Applied Sci., 9: 303-322. DOI: 10.3844/ajeassp.2016.303.322

Lubis, Z., A.N.A. Mortaza and R. Ghon, 2009. Mathematical modeling of the three phase induction motor couple to dc motor in hybrid electric vehicle. Am. J. Eng. Applied Sci., 2: 708-712. DOI: 10.3844/ajeassp.2009.708.712

Madani, D.A. and A. Dababneh, 2016. Rapid entire body assessment: A literature review. Am. J. Eng. Applied Sci., 9: 107-118. DOI: 10.3844/ajeassp.2016.107.118

Malomar, G.E.B., A. Gueye, C. Mbow, V.B. Traore and A.C. Beye, 2016. Numerical study of natural convection in a square porous cavity thermally modulated on both side walls. Am. J. Eng. Applied Sci., 9: 591-598. DOI: 10.3844/ajeassp.2016.591.598

Mansour, M.A.A., 2016. Developing an anthropometric database for saudi students and comparing Saudi dimensions relative to Turkish and Iranian peoples. Am. J. Eng. Applied Sci., 9: 547-557. DOI: 10.3844/ajeassp.2016.547.557

Marghany, M. and M. Hashim, 2009. Robust of doppler centroid for mapping sea surface current by using radar satellite data. Am. J. Eng. Applied Sci., 2: 781-788. DOI: 10.3844/ajeassp.2009.781.788

Martins, F.R., A.R. Gonçalves and E.B. Pereira, 2016. Observational study of wind shear in northeastern Brazil. Am. J. Eng. Applied Sci., 9: 484-504. DOI: 10.3844/ajeassp.2016.484.504

Mavukkandy, M.O., S. Chakraborty, T. Abbasi and S.A. Abbasi, 2016. A clean-green synthesis of platinum nanoparticles utilizing a pernicious weed Lantana (Lantana Camara). Am. J. Eng. Applied Sci., 9: 84-90. DOI: 10.3844/ajeassp.2016.84.90

Minghini, F., N. Tullini and F. Ascione, 2016. Updating Italian design guide CNR DT-205/2007 in view of recent research findings: Requirements for pultruded FRP profiles. Am. J. Eng. Applied Sci., 9: 702-712. DOI: 10.3844/ajeassp.2016.702.712

Moezi, N., D. Dideban and A. Ketabi, 2008. A novel integrated SET based inverter for nano power electronic applications. Am. J. Eng. Applied Sci., 1: 219-222. DOI: 10.3844/ajeassp.2008.219.222

Mohamed, M.A., A.Y. Tuama, M. Makhtar, M.K. Awang and M. Mamat, 2016. The effect of RSA exponential key growth on the multi-core computational resource. Am. J. Eng. Applied Sci., 9: 1054-1061. DOI: 10.3844/ajeassp.2016.1054.1061

Mohan, K.S.R., P. Jayabalan and A. Rajaraman, 2012. Properties of fly ash based coconut fiber composite. Am. J. Eng. Applied Sci., 5: 29-34. DOI: 10.3844/ajeassp.2012.29.34

Mohseni, E. and K.D. Tsavdaridis, 2016. Effect of nano-alumina on pore structure and durability of class f fly ash self-compacting mortar. Am. J. Eng. Applied Sci., 9: 323-333. DOI: 10.3844/ajeassp.2016.323.333

Momani, M.A., T.A. Al Smadi, F.M. Al Taweel and K.A. Ghaidan, 2011. GPS ionospheric total electron content and scintillation measurements during the October 2003 magnetic storm. Am. J. Eng. Applied Sci., 4: 301-306. DOI: 10.3844/ajeassp.2011.301.306

Mondal, R., S. Sahoo and C.S. Rout, 2016. Mixed nickel cobalt manganese oxide nanorods for supercapacitor application. Am. J. Eng. Applied Sci., 9: 540-546. DOI: 10.3844/ajeassp.2016.540.546

Montgomery, J., T.M. Abu-Lebdeh, S.A. Hamoush and M. Picornell, 2016. Effect of nano-silica on the compressive strength of harden cement paste at different stages of hydration. Am. J. Eng. Applied Sci., 9: 166-177. DOI: 10.3844/ajeassp.2016.166.177

Morse, A., M.M. Mansfield, R.M. Alley, H.A. Kerr and R.B. Bucinell, 2016b. Traction enhancing products affect maximum torque at the shoe-floor interface: A potential increased risk of ACL injury. Am. J. Eng. Applied Sci., 9: 889-893. DOI: 10.3844/ajeassp.2016.889.893

Moubarek, T. and A. Gharsallah, 2016. A six-port reflectometer calibration using wilkinson power divider. Am. J. Eng. Applied Sci., 9: 274-280. DOI: 10.3844/ajeassp.2016.274.280

Nabilou, A., 2016a. Effect of parameters of selection and replacement drilling bits based on geo-mechanical factors: (Case study: Gas and oil reservoir in the Southwest of Iran). Am. J. Eng. Applied Sci., 9: 380-395. DOI: 10.3844/ajeassp.2016.380.395

Nabilou, A., 2016b. Study of the parameters of Steam Assisted Gravity Drainage (SAGD) method for enhanced oil recovery in a heavy oil fractured carbonate reservoir. Am. J. Eng. Applied Sci., 9: 647-658. DOI: 10.3844/ajeassp.2016.647.658

Nachiengtai, T., W. Chim-Oye, S. Teachavorasinskun and W. Sa-Ngiamvibool, 2008. Identification of shear band using elastic shear wave propagation. Am. J. Eng. Applied Sci., 1: 188-191. DOI: 10.3844/ajeassp.2008.188.191

Nahas, R. and S.P. Kozaitis, 2014. Metric for the fusion of synthetic and real imagery from multimodal sensors. Am. J. Eng. Applied Sci., 7: 355-362. DOI: 10.3844/ajeassp.2014.355.362

Nandhakumar, S., V. Selladurai and S. Sekar, 2009. Numerical investigation of an industrial robot arm control problem using haar wavelet series. Am. J. Eng. Applied Sci., 2: 584-589. DOI: 10.3844/ajeassp.2009.584.589

Ng, K.C., M.Z. Yusoff, K. Munisamy, H. Hasini and N. H. Shuaib, 2008. Time-marching method for computations of high-speed compressible flow on structured and unstructured grid. Am. J. Eng. Applied Sci., 1: 89-94. DOI: 10.3844/ajeassp.2008.89.94

Obaiys, S.J., Z. Abbas, N.M.A. Nik Long, A.F. Ahmad and H.K. Raad, 2016. On the general solution of first-kind hypersingular integral equations. Am. J. Eng. Applied Sci., 9: 195-201. DOI: 10.3844/ajeassp.2016.195.201

Odeh, S., R. Faqeh, L.A. Eid and N. Shamasneh, 2009. Vision-based obstacle avoidance of mobile robot using quantized spatial model. Am. J. Eng. Applied Sci., 2: 611-619. DOI: 10.3844/ajeassp.2009.611.619

Opafunso, Z.O., I.I. Ozigis and I.A. Adetunde, 2009. Pneumatic and hydraulic systems in coal fluidized bed combustor. Am. J. Eng. Applied Sci., 2: 88-95. DOI: 10.3844/ajeassp.2009.88.95

Orlando, N. and E. Benvenuti, 2016. Advanced XFEM simulation of pull-out and debonding of steel bars and FRP-reinforcements in concrete beams. Am. J. Eng. Applied Sci., 9: 746-754. DOI: 10.3844/ajeassp.2016.746.754

Pannirselvam, N., P.N. Raghunath and K. Suguna, 2008. Neural network for performance of glass fibre reinforced polymer plated RC beams, Am. J. Eng. Applied Sci., 1: 82-88. DOI: 10.3844/ajeassp.2008.82.88

Pattanasethanon, S., 2010. The solar tracking system by using digital solar position sensor. Am. J. Eng. Applied Sci., 3: 678-682. DOI: 10.3844/ajeassp.2010.678.682

Petrescu, F. and R. Petrescu, 1995a. Contributions to the optimization of the polynomial motion laws of the stick from the internal combustion engine distribution mechanism. Bucharest.

Petrescu, F. and R. Petrescu, 1995b. Contributions to the synthesis of distribution mechanisms of internal combustion engines. Bucharest.

Petrescu, F. and R. Petrescu, 1997a. Dynamics of cam mechanisms (exemplified on the classic distribution mechanism). Bucharest.

Petrescu, F. and R. Petrescu, 1997b. Contributions to the synthesis of the distribution mechanisms of internal combustion engines with Cartesian coordinate method. Bucharest.

Petrescu, F. and R. Petrescu, 1997c. Contributions to the maximization of polynomial laws for the active stroke of the distribution mechanism from internal combustion engines. Bucharest.

Petrescu, F. and R. Petrescu, 2000a. Synthesis of distribution mechanisms by the rectangular coordinate method (Cartesian). Craiova University, Craiova.

Petrescu, F. and R. Petrescu, 2000b. The design (synthesis) of cam mechanism by the polar coordinates method (triangle method). Craiova University, Craiova.

Petrescu, F. and R. Petrescu, 2002a. Motion laws for cam mechanisms. Proceedings of the 7th National Symposium with International Participation Computer Assisted Design, (CAD' 02), Braşov, pp: 321-326.

Petrescu, F. and R. Petrescu, 2005a. The cam design for a better efficiency. Proceedings of the International Conference on Engineering Graphics and Design, (EGD' 05), Bucharest, pp: 245-248.

Petrescu, F. and R. Petrescu, 2005b. Contributions at the dynamics of cams. Proceedings of the 9th IFToMM International Symposium on Theory of Machines and Mechanisms, (ROM, 05), Bucharest, Romania, pp: 123-128.

Petrescu, F. and R. Petrescu, 2005c. Determining the dynamic efficiency of cams. Proceedings of the 9th IFToMM International Symposium on Theory of Machines and Mechanisms, (ROM' 05), Bucharest, Romania, pp: 129-134.

Petrescu, F. and R. Petrescu, 2005d. An original internal combustion engine. Proceedings of the 9th IFToMM International Symposium on Theory of Machines and Mechanisms, (ROM, 05), Bucharest, Romania, pp: 135-140.

Petrescu, F. and R. Petrescu, 2005e. Determining the mechanical efficiency of Otto engine's mechanism. Proceedings of the 9th IFToMM International Symposium on Theory of Machines and Mechanisms, (ROM' 05), Bucharest, Romania, pp: 141-146.

Petrescu, F. and R., Petrescu, 2003. Some elements regarding the improvement of the engine design. Proceeding of the 14th National Symposium, Descriptive Geometry, Technical Graphics and Design, (GTD' 03), Braşov, pp: 353-358.

Petrescu, F.I. and R.V. Petrescu, 2011. Memories about Flight.1st Edn., CreateSpace, pp: 652.

Petrescu, F.I. and R.V. Petrescu, 2012. New Aircraft II.1st Edn., Books On Demand, pp: 138.

Petrescu, F.I.T. and J.K. Calautit, 2016a. About nano fusion and dynamic fusion. Am. J. Applied Sci., 13: 261-266.

Petrescu, F.I.T. and J.K. Calautit, 2016b. About the light dimensions. Am. J. Applied Sci., 13: 321-325.

Petrescu, F.I.T. and R.V. Petrescu, 2013d. Forces and efficiency of Cams. Int. Rev. Mechanical Eng., 3: 507-511.

Petrescu, F.I.T. and R.V. Petrescu, 2013e. Cams with high efficiency. Int. Rev. Mechanical Eng., 4: 599-606.

Petrescu, F.I.T. and R.V. Petrescu, 2013f. An algorithm for setting the dynamic parameters of the classic distribution mechanism. Int. Rev. Modell. Simulat., 5: 1637-1641.

Petrescu, F.I.T. and R.V. Petrescu, 2013g. Dynamic synthesis of the rotary cam and translated tappet with roll. Int. Rev. Modell. Simulat., 2: 600-607.

Petrescu, F.I.T. and R.V. Petrescu, 2014b. Cam gears dynamics in the classic distribution. Independent J. Managem. Product., 1: 166-185.

Petrescu, F.I.T. and R.V. Petrescu, 2014c. High-efficiency gears synthesis by avoid the interferences. Independent J. Managem. Product., 2: 275-298.

Petrescu, F.I.T. and R.V. Petrescu, 2014d. Gear design. J. ENGEVISTA, 4: 313-328.

Petrescu, F.I.T. and R.V. Petrescu, 2014e. Kinetostatic of the 3R dyad (or 2R Module). J. ENGEVISTA, 3: 314-321.

Petrescu, F.I.T. and R.V. Petrescu, 2014f. Balancing otto engines. Int. Rev. Mechanical Eng., 3: 473-480.

Petrescu, F.I.T. and R.V. Petrescu, 2014g. Machine equations to the classical distribution. Int. Rev. Mechanical Eng.2: 309-316.

Petrescu, F.I.T. and R.V. Petrescu, 2014h. Forces of internal combustion heat engines. Int. Rev. Modell. Simulat., 1: 206-212.

Petrescu, F.I.T. and R.V. Petrescu, 2014i. Determination of the yield of internal combustion thermal engines. Int. Rev. Mechanical Eng., 1:62-67.

Petrescu, F.I.T., 2015a. Geometrical synthesis of the distribution mechanisms. Am. J. Eng. Applied Sci., 8: 63-81. DOI: 10.3844/ajeassp.2015.63.81

Petrescu, F.I.T., 2015b. Machine motion equations at the internal combustion heat engines. Am. J. Eng. Applied Sci., 8: 127-137.
DOI: 10.3844/ajeassp.2015.127.137

Petrescu, F.I.T. and R.V. Petrescu, 2015d. Presenting a railbound forging manipulator. Applied Mechanics Materials, 762: 219-224.

Petrescu, F.I.T. and R.V. Petrescu, 2015e. About the anthropomorphic robots. J. ENGEVISTA, 1: 1-15.

Petrescu, F.I.T., 2018. About the nuclear particles' structure and dimensions. Comp. Part. Mech., 6: 191-194.
DOI: 10.1007/S40571-018-0206-7

Petrescu, F.I.T., 2012a. Cold nuclear fusion. Plasma Phys. Fusion Technol., 44: 100-100.

Petrescu, F.I.T., A. Apicella, R. V. Petrescu, S. P. Kozaitis and R.B. Bucinell *et al.*, 2016. Environmental protection through nuclear energy. Am. J. Applied Sci.,, 13: 941-946.

Petrescu, F.I.T., Petrescu, R. V., 2014a. Parallel moving mechanical systems. Independent J. Managem. Product., 3: 64-580.

Petrescu, F.I.T. and RV. Petrescu, 2015a. Forces at the main mechanism of a railbound forging manipulator. Independent J. Managem. Product., 6: 904-921.

Petrescu, F.I.T. and RV. Petrescu, 2015b. Kinematics at the main mechanism of a railbound forging manipulator. Independent J. Managem. Product., 6: 711-729.

Petrescu, F.I.T. and R.V. Petrescu, 2015c. Machine motion equations. Independent J. Managem. Product., 6: 773-802.

Petrescu, F.I.T. and R.V. Petrescu, 2016. An otto engine dynamic model. Independent J. Managem. Product., 7: 038-048.

Petrescu, F.I.T., 2012b. CreateSpace Independent Publisher.1st Edn., China, ISBN-13: 978-1469973623, pp: 232.

Petrescu, R.V. and F.I. Petrescu, 2013a. Lockheed Martin.1st Edn., BoD-Books on Demand, ISBN-10: 3848230739, pp: 114.

Petrescu, R.V. and F.I. Petrescu, 2013b. Northrop.1st Edn., CreateSpace.

Petrescu, R.V. and F.I. Petrescu, 2013c. The Aviation History or New Aircraft I Color.1st Edn., CreateSpace, pp: 292.

Petrescu, R.V., R. Aversa, A. Apicella and F.I.T. Petrescu, 2018a. Total static balancing and kinetostatics of the 3R base cinematic Chain. J. Mechatron. Robot., 2: 1-13. DOI: 10.3844/jmrsp.2018.1.13

Petrescu, R.V., R. Aversa, A. Apicella and F.I.T. Petrescu, 2018b. Switching from flat to spatial motion to 3R mechatronic systems. J. Mechatron. Robot., 2: 14-22. DOI: 10.3844/jmrsp.2018.14.22

Petrescu, R.V., R. Aversa, A. Apicella and F.I.T. Petrescu, 2018c. The dynamics of the planar cinematic balanced chain at the plan module 3R. J. Mechatron. Robot., 2: 23-34. DOI: 10.3844/jmrsp.2018.23.34

Petrescu, R.V., R. Aversa, A. Apicella and F.I.T. Petrescu, 2018d. Dynamic kinematics of the plan balanced chain at the planar module 3R. J. Mechatron. Robot., 2: 35-44. DOI: 10.3844/jmrsp.2018.35.44

Petrescu, R.V., R. Aversa, B. Akash and A. Apicella *et al.*, 2017d. Geometry and direct kinematics to MP3R with 4×4 operators. J. Mechatron. Robot., 1: 38-46. DOI: 10.3844/jmrsp.2017.38.46

Petrescu, R.V., R. Aversa, B. Akash, F. Berto and A. Apicella *et al.*, 2017a. Forces of a 3R robot. J. Mechatron. Robot., 1: 1-14. DOI: 10.3844/jmrsp.2017.1.14

Petrescu, R.V., R. Aversa, B. Akash, F. Berto and A. Apicella *et al.*, 2017b. Direct geometry and cinematic to the MP-3R systems. J. Mechatron. Robot., 1: 15-23. DOI: 10.3844/jmrsp.2017.15.23

Petrescu, R. V., R. Aversa, B. Akash, F. Berto and A. Apicella *et al.*, 2017c. Dynamic elements at MP3R. J. Mechatron. Robot., 1: 24-37. DOI: 10.3844/jmrsp.2017.24.37

Pisello, A. L., G. Pignatta, C. Piselli, V. L. Castaldo and F. Cotana, 2016. Investigating the dynamic thermal behavior of building envelope in summer conditions by means of in-field continuous monitoring. Am. J. Eng. Applied Sci., 9: 505-519. DOI: 10.3844/ajeassp.2016.505.519

Pourmahmoud, N., 2008. Rarefied Gas Flow modeling inside rotating circular cylinder. Am. J. Eng. Applied Sci., 1: 62-65. DOI: 10.3844/ajeassp.2008.62.65

Pravettoni, M., C. S. P. Lòpez and R. P. Kenny, 2016. Impact of the edges of a backside diffusive reflector on the external quantum efficiency of luminescent solar concentrators: experimental and computational approach. Am. J. Eng. Applied Sci., 9: 53-63. DOI: 10.3844/ajeassp.2016.53.63

Qadi, A. N. S. A. L.. M. B. A. ALhasanat, A. A. L. Dahamsheh and S. A. L. Zaiydneen, 2016a. Using of box-benken method to predict the compressive strength of self-compacting concrete containing wadi musa bentonite. Jordan. Am. J. Eng. Applied Sci., 9: 406-411. DOI: 10.3844/ajeassp.2016.406.411

Qadi, A. N. S. A., M. B. A. Alhasanat and M. Haddad, 2016b. Effect of crumb rubber as coarse and fine aggregates on the properties of asphalt concrete. Am. J. Eng. Applied Sci., 9: 558-564. DOI: 10.3844/ajeassp.2016.558.564

Qutbodin, K., 2010. Merging autopilot/flight control and navigation-flight management systems. Am. J. Eng. Applied Sci., 3: 629-630. DOI: 10.3844/ajeassp.2010.629.630

Rajbhandari, S., Z. Ghassemlooy and M. Angelova, 2011. The performance of a dual header pulse interval modulation in the presence of artificial light interferences in an indoor optical wireless communications channel with wavelet denoising. Am. J. Eng. Applied Sci., 4: 513-519. DOI: 10.3844/ajeassp.2011.513.519

Rajput, R.S., S. Pandey and S. Bhadauria, 2016. Correlation of biodiversity of algal genera with special reference to the waste water effluents from industries. Am. J. Eng. Applied Sci., 9: 1127-1133. DOI: 10.3844/ajeassp.2016.1127.1133

Rama, G., D. Marinkovic and M. Zehn, 2016. Efficient co-rotational 3-node shell element. Am. J. Eng. Applied Sci., 9: 420-431. DOI: 10.3844/ajeassp.2016.420.431

Raptis, K. G., G. A. Papadopoulos, T. N. Costopoulos and A. D. Tsolakis, 2011. Experimental study of load sharing in roller-bearing contact by caustics and photoelasticity. Am. J. Eng. Applied Sci., 4: 294-300. DOI: 10.3844/ajeassp.2011.294.300

Rea, P. and E. Ottaviano, 2016. Analysis and mechanical design solutions for sit-to-stand assisting devices. Am. J. Eng. Applied Sci., 9: 1134-1143. DOI: 10.3844/ajeassp.2016.1134.1143

Riccio, A., U. Caruso, A. Raimondo and A. Sellitto, 2016a. Robustness of XFEM method for the simulation of cracks propagation in fracture mechanics problems. Am. J. Eng. Applied Sci., 9: 599-610. DOI: 10.3844/ajeassp.2016.599.610

Riccio, A., R. Cristiano and S. Saputo, 2016b. A brief introduction to the bird strike numerical simulation. Am. J. Eng. Applied Sci., 9: 946-950. DOI: 10.3844/ajeassp.2016.946.950

Rich, F. and M. A. Badar, 2016. Statistical analysis of auto dilution Vs manual dilution process in inductively coupled plasma spectrometer tests. Am. J. Eng. Applied Sci., 9: 611-624. DOI: 10.3844/ajeassp.2016.611.624

Rohit, K. and S. Dixit, 2016. Mechanical properties of waste Biaxially Oriented Polypropylene Metallized Films (BOPP), LLDPE: LDPE films with sisal fibres. Am. J. Eng. Applied Sci., 9: 913-920. DOI: 10.3844/ajeassp.2016.913.920

Rulkov, N.F., A. Hunt, P.N. Rulkov and A.G. Maksimov, 2016. Quantization of map-based neuronal model for embedded simulations of neurobiological networks in real-time. Am. J. Eng. Applied Sci., 9: 973-984. DOI: 10.3844/ajeassp.2016.973.984

Saikia, A. and N. Karak, 2016. Castor oil based epoxy/clay nanocomposite for advanced applications. Am. J. Eng. Applied Sci., 9: 31-40. DOI: 10.3844/ajeassp.2016.31.40

Sallami, A., N. Zanzouri and M. Ksouri, 2016. Robust diagnosis of a DC motor by bond graph approach. Am. J. Eng. Applied Sci., 9: 432-438. DOI: 10.3844/ajeassp.2016.432.438

Samantaray, K. S., S. Sahoo and C. S. Rout, 2016. Hydrothermal synthesis of CuWO4-reduced graphene oxide hybrids and supercapacitor application. Am. J. Eng. Applied Sci., 9: 584-590. DOI: 10.3844/ajeassp.2016.584.590

Santos, F. A. D. and C. Bedon, 2016. Preliminary experimental and finite-element numerical assessment of the structural performance of SMA-reinforced gfrp systems. Am. J. Eng. Applied Sci., 9: 692-701. DOI: 10.3844/ajeassp.2016.692.701

Semin and R. A. Bakar, 2008. A technical review of compressed natural gas as an alternative fuel for internal combustion engines. Am. J. Eng. Applied Sci., 1: 302-311. DOI: 10.3844/ajeassp.2008.302.311

Semin, AR. I. and RA. Bakar, 2009a. Combustion temperature effect of diesel engine convert to compressed natural gas engine. Am. J. Eng. Applied Sci., 2: 212-216. DOI: 10.3844/ajeassp.2009.212.216

Semin, AR. I. and RA. Bakar, 2009b. Effect of diesel engine converted to sequential port injection compressed natural gas engine on the cylinder pressure vs crank angle in variation engine speeds. Am. J. Eng. Applied Sci., 2: 154-159. DOI: 10.3844/ajeassp.2009.154.159

Semin, S., AR. I. and RA. Bakar, 2009c. Diesel engine convert to port injection CNG engine using gaseous injector Nozzle multi holes geometries improvement: A review. Am. J. Eng. Applied Sci., 2: 268-278. DOI: 10.3844/ajeassp.2009.268.278

Sepúlveda, J.A.M., 2016. Outlook of municipal solid waste in bogota (Colombia). Am. J. Eng. Applied Sci., 9: 477-483. DOI: 10.3844/ajeassp.2016.477.483

Serebrennikov, A., D. Serebrennikov and Z. Hakimov, 2016. Polyethylene pipeline bending stresses at an installation. Am. J. Eng. Applied Sci., 9: 350-355. DOI: 10.3844/ajeassp.2016.350.355

Shanmugam, K., 2016. Flow dynamic behavior of fish oil/silver nitrate solution in mini-channel, effect of alkane addition on flow pattern and interfacial tension. Am. J. Eng. Applied Sci., 9: 236-250. DOI: 10.3844/ajeassp.2016.236.250

Shruti, 2016. Comparison in cover media under stegnography: Digital media by hide and seek approach. Am. J. Eng. Applied Sci., 9: 297-302. DOI: 10.3844/ajeassp.2016.297.302

Smadi, A. T. A.2011. Low cost smart sensor design. Am. J. Eng. Applied Sci., 4: 162-168. DOI: 10.3844/ajeassp.2011.162.168

Suarez, L., T. M. Abu-Lebdeh, M. Picornell and S. A. Hamoush, 2016. Investigating the role of fly ash and silica fume in the cement hydration process. Am. J. Eng. Applied Sci., 9: 134-145. DOI: 10.3844/ajeassp.2016.134.145

Syahrullah, O. I. and N. Sinaga, 2016. Optimization and prediction of motorcycle injection system performance with feed-forward back-propagation method Artificial Neural Network (ANN). Am. J. Eng. Applied Sci., 9: 222-235. DOI: 10.3844/ajeassp.2016.222.235

Taher, S. A., R. Hematti and M. Nemati, 2008. Comparison of different control strategies in GA-based optimized UPFC controller in electric power systems. Am. J. Eng. Applied Sci., 1: 45-52. DOI: 10.3844/ajeassp.2008.45.52

Theansuwan, W. and K. Triratanasirichai, 2011. The biodiesel production from roast thai sausage oil by transesterification reaction. Am. J. Eng. Applied Sci., 4: 130-132. DOI: 10.3844/ajeassp.2011.130.132

Thongwan, T., A. Kangrang and S. Homwuttiwong, 2011. An estimation of rainfall using Fuzzy set-genetic algorithms model. Am. J. Eng. Applied Sci., 4: 77-81. DOI: 10.3844/ajeassp.2011.77.81

Tourab, W., A. Babouri and M. Nemamcha, 2011. Experimental study of electromagnetic environment in the vicinity of high voltage lines. Am. J. Eng. Applied Sci., 4: 209-213. DOI: 10.3844/ajeassp.2011.209.213

Tsolakis, A. D. and K. G. Raptis, 2011. Comparison of maximum gear-tooth operating bending stresses derived from niemann's analytical procedure and the finite element method, Am. J. Eng. Applied Sci., 4: 350-354. DOI: 10.3844/ajeassp.2011.350.354

Wang, J. and Y. Yagi, 2016. Fragment-based visual tracking with multiple representations. Am. J. Eng. Applied Sci., 9: 187-194. DOI: 10.3844/ajeassp.2016.187.194

Wang, L., T. Liu, Y. Zhang and X. Yuan, 2016. A methodology for continuous evaluation of cloud resiliency. Am. J. Eng. Applied Sci., 9: 264-273. DOI: 10.3844/ajeassp.2016.264.273

Waters, C., S. Ajinola and M. Salih, 2016. Dissolution sintering technique to create porous copper with sodium chloride using polyvinyl alcohol solution through powder metallurgy. Am. J. Eng. Applied Sci., 9: 155-165. DOI: 10.3844/ajeassp.2016.155.165

Wessels, L. and H. Raad, 2016. Recent advances in point of care diagnostic tools: A review, Am. J. Eng. Applied Sci., 9: 1088-1095. DOI: 10.3844/ajeassp.2016.1088.1095

Yeargin, R., R. Ramey and C. Waters, 2016. Porosity analysis in porous brass using dual approaches. Am. J. Eng. Applied Sci., 9: 91-97. DOI: 10.3844/ajeassp.2016.91.97

You, M., X. Huang, M. Lin, Q. Tong and Y. Yang *et al.*, 2016. Preparation of LiCoMnO4 assisted by hydrothermal approach and its electrochemical performance. Am. J. Eng. Applied Sci., 9: 396-405. DOI: 10.3844/ajeassp.2016.396.405

Zeferino, R. S., J. A. R. Ramón, E. D. A. Reyes, R. S. González and U. Pal, 2016. Large scale synthesis of ZnO nanostructures of different morphologies through solvent-free mechanochemical synthesis and their application in photocatalytic dye degradation. Am. J. Eng. Applied Sci., 9: 41-52. DOI: 10.3844/ajeassp.2016.41.52

Zhao, B., 2013. Identification of multi-cracks in the gate rotor shaft based on the wavelet finite element method. Am. J. Eng. Applied Sci., 6: 309-319. DOI: 10.3844/ajeassp.2013.309.319

Zheng, H. and S. Li, 2016. Fast and robust maximum power point tracking for solar photovoltaic systems. Am. J. Eng. Applied Sci., 9: 755-769. DOI: 10.3844/ajeassp.2016.755.769

Zotos, I. S. and T. N. Costopoulos, 2009. On the use of rolling element bearings' models in precision maintenance. Am. J. Eng. Applied Sci., 2: 344-352. DOI: 10.3844/ajeassp.2009.344.352

Zulkifli, R., K. Sopian, S. Abdullah and M. S. Takriff, 2008. Effect of pulsating circular hot air jet frequencies on local and average nusselt number. Am. J. Eng. Applied Sci., 1: 57-61. DOI: 10.3844/ajeassp.2008.57.61

Zulkifli, R., K. Sopian, S. Abdullah and M. S. Takriff, 2009. Experimental study of flow structures of circular pulsating air jet, Am. J. Eng. Applied Sci., 2: 171-175. DOI: 10.3844/ajeassp.2009.171.175

Zurfi, A. and J. Zhang, 2016a. Model identification and wall-plug efficiency measurement of white LED modules. Am. J. Eng. Applied Sci., 9: 412-419. DOI: 10.3844/ajeassp.2016.412.419

Zurfi, A. and J. Zhang, 2016b. Exploitation of battery energy storage in load frequency control -a literature survey. Am. J. Eng. Applied Sci., 9: 1173-1188. DOI: 10.3844/ajeassp.2016.1173.1188

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