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Design and Fabrication of Flying Robot

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Abstract--- *As it is very much suitable to have a monitor view of a restricted area, this work has been taken up to fabricate such a flying robot. This is a high-tech remote flying robot specially designed for surveillance and monitoring application in military. The robot has battery powered propeller engine with two channel Radio Frequency (R.F) remote control. A high resolution colour camera with high frequency range transmitter is equipped for surveillance monitoring. A powerful transmitter and receiver enable to monitor surveillance up to distance of around hundred feet, Remote control is provided to control the robot. `The base transmitter transmits the signal, the signal is captured by the receiver in the robot and the received signal is fed to the Microcontroller Unit (MCU) where the signal is separated and is fed to independent motor drive circuit connected to high speed Direct Current (D.C) motor. A high frequency video camera is used to capture the live pictures which are transmitted to the base through a separate antenna fixed in the robot. The base unit has a receiver that gives video output which can be viewed in the monitor. This robot can be used where man cannot perform the task such as capture enemies landscape, gun fire operation and surveillance. A camera is used to monitor the surrounding. The robot configuration includes control transmitters for flying model robot, wireless camera and modulator receiver.*

Keywords--- *Flying Robot, Design and Fabrication, Highly Complex, Computer-Controlled Intelligent Systems.*

I. INTRODUCTION

This is a high–tech robot specially designed for surveillance and rescue application. A high resolution camera enables to monitor surveillance from up to a distance of 100 meters. The vehicle can be operated using a dedicated control transmitter operating under a certain frequency band. The Radio Frequency (RF) signal can pass through walls and partitions. This robot can be used where man cannot perform his task due to nature's difficulties. The robot kit includes control transmitter for four rotors with 2.4GHz wireless camera receiver.

It is like a person who woks mechanically without own thought, especially one who responds automatically to the command fed by others. Robots are machines that can be programmed to perform a variety of jobs, and they can range from simple machines to highly complex, computer-controlled intelligent systems. According to the principle of aerodynamics, Flight involves a balance of forces. These forces are thrust, drag, lift and weight. When thrust and drag are equal, the speed of the aircraft through the air (airspeed) will remain constant in air. When lift and weight are equal, the aircraft will neither ascend nor descend.

Robotics involve design and manufacture of intelligent machines that are programmed to perform specific tasks. Robots are machines that can be programmed to perform a variety of jobs, and they can range from simple machines to highly complex, computer-controlled intelligent systems.

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Communication is a process in which ideas, information or feelings are exchanged to the maximum benefit of all parties. In this work, wireless communication is used for motion control of the plane and also for signal transfer through a camera. A CCD camera is used for this purpose. It is a 7.2 mega pixel camera with a downloading frequency of 2.4 GHz. The transmitter has four switches, which are logically set with digital data with MCU. The control data is encoded in the next stage and fed to the RF data transmitter

The benefits of using electronics in robotic systems are

1. Power requirements are typically less than for electromechanical system.
2. Micro controller-based devices are smaller and lighter than pure mechanical systems.
3. Electronics provides a wide variety of changeable functions by simply reprogramming the chip with the new product features.
4. The systems with fewer moving parts are more reliable while providing a longer life.

Block Diagram of Microcontroller 8051

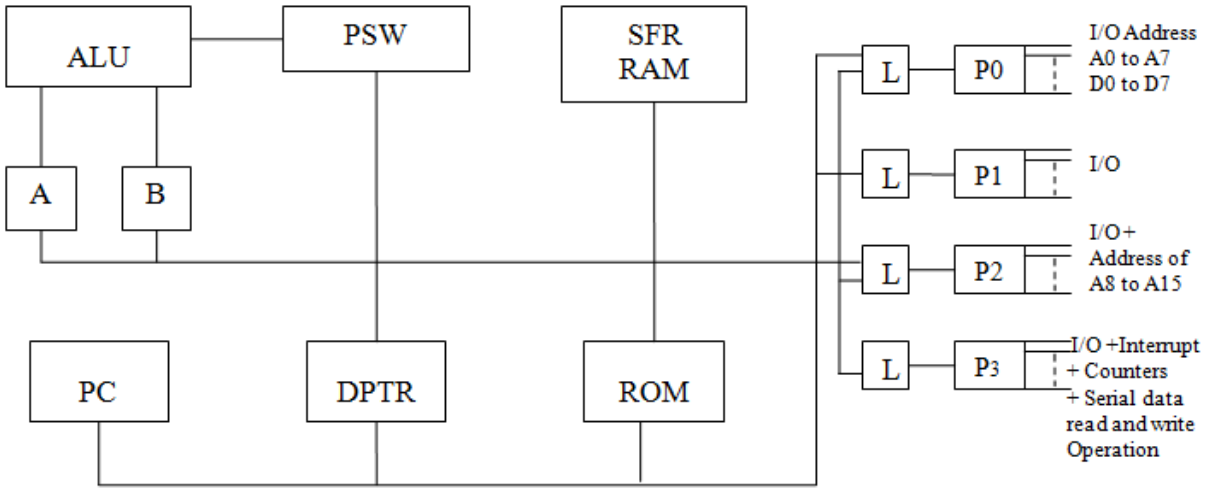

Fig.1: Micro Controller 8051

ALU – Arithmetic logic Unit

PSW – Program Status word

SFR – Special Function Register

DPTR – Data Pointer

PC – Program Counter

A & B – Immediate Register

L – Latches (Temporary Memory Areas)

P (0-3) – Ports

This work is mainly based on two things,

- Signal control
- Motion control

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It is set with 433MHz frequency (Industrial scientific and medical band frequency) for controlling the speed of motors and as well as for 2.4GHz downloading frequency of camera.

Industrial scientific and medical (I.S.M) band is a license free frequency band which is used for research and project purposes only. The plane is embedded with a very light weight antennae which is capable of sending to and also receiving signals from base station.

The plane has four rotors for thrust generation and for motion control of the plane. A remote control is used to control the plane motion. When we move the joystick, there is some change in voltage, and it is observed by the analog to digital converter (ADC), which affect the gates. So it creates variation in packet transmission between ADC and microcontroller unit (M.C.U).then resulting encoded data send to antennae and transmitted to plane which creates a variation in rotor speed so that the plane motion control.

Signal and Motion Control

Signal Control

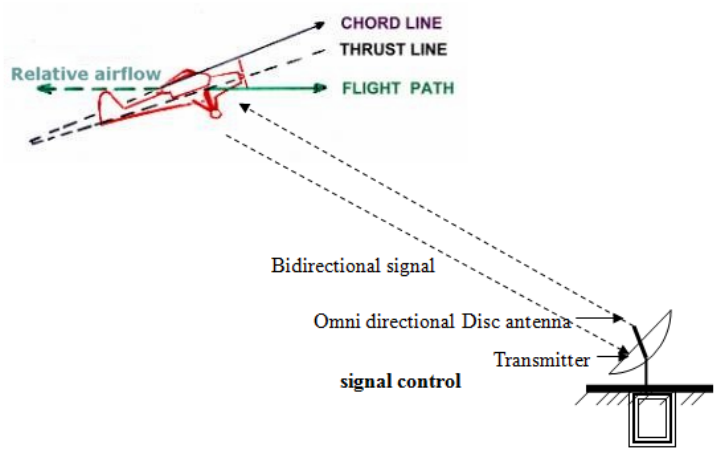

Fig. 2: Signal Control

Motion Control

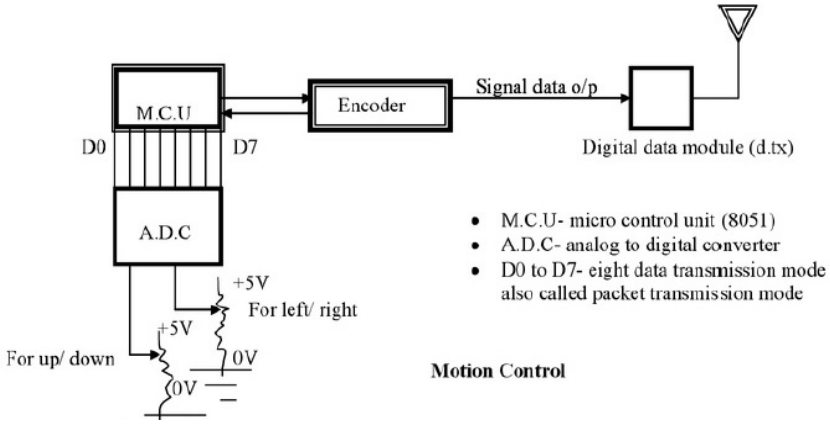

Fig. 3: Motion Control

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Required Parameters

- Battery : 650 MAH Ni-mh rechargeable
- Charging hour : six (6)
- Flying time : 10-20 minute
- Number of channel : Two (2)
- Motor : four independent motor
- Speed : 10,000-25,000 rpm
- Transmitter : 8 “AA” size batteries (12 volt)
- Frequencies : 433.92 MHz (I.S.M Band)
- Downloading Frequencies : 2.4 GHz (for camera)

Design Description of Plane Body

- Wing span : 3.5 feet (or) 42 inch
- Wing span width : 8 inch
- Length of body : 27 inch
- Height of body : 6 inch
- Weight of body : 5 Newton (≈ 500 grams)
- Material used : Compressed Thermocol (EPS and PSP foaming)

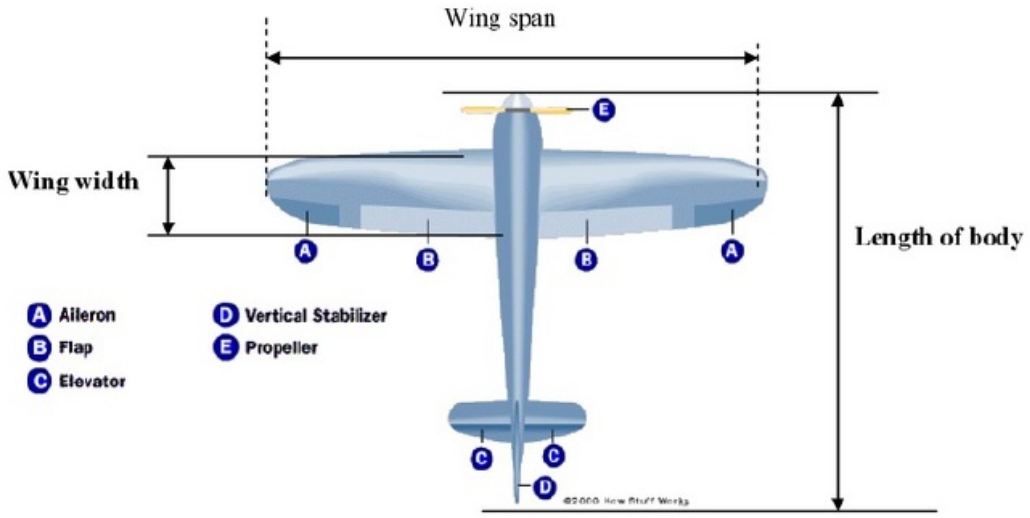

Fig. 4: Description of Plane Body

Required Parameters

- Battery : 650 MAH Ni-mh rechargeable
- Charging hour : six (6)
- Flying time : 10-20 minute

- Number of channel : Two (2)
- Motor : four independent motor
- Speed : 10,000-25,000 rpm
- Transmitter : 8 “AA” size batteries (12 volt)
- Frequencies : 433.92 MHz (I.S.M Band)
- Downloading Frequencies : 2.4 GHz (for camera)

Design Calculation

Velocity Calculation for Flying Body

Equation of Flight is**, $L = C_l \times \frac{1}{2} \times \rho \times V^2 \times A$**

Where, L = lift (or) weight in Newton. C_l = lift coefficient (≈ 0.6).

ρ (rho) = air density (1.25) in kg/cube meter. V = velocity of plane in m/sec.

A = wing area in square meter.

Model Calculation for Velocity of Flight

As per our design description

- Weight of body “W”= 5 N
- Density of air “ρ”= 1.25 kg/ m³
- Length of wing span= 106.68 cm
- Width of wing span= 20.32 cm

So, Area of wing spans “A” ≈ 1.0668 × 0.2032 = 0.2167 sq m

Therefore, velocity $\text{“V”} = \sqrt{\{(2\ W)/(C_l \times \rho \times A)\}} = 7.84$ m/sec

II. CONCLUSIONS

Robotics is an innovative world of construction of an autonomous agent to perform the desired task as intelligently. This remote controlled robot in action with 2.4 GHz camera could serve this purpose. This is the most advanced robotic plane, which can be used for surveillance and monitoring application.

The robot is designed as such it will move by searching the way through the camera with two channels RF remote control, which is controlled by micro controller unit. This technology is the most advanced technology seen in the world of robotic innovation.

Advantages and Application

- 2.4 GHZ frequency for good communication interference
- Compact and easy design
- Low power consumption
- Remote unmanned surveillance
- Application/monitoring

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- Search in tuned/ un alternated work used application
- Less noise produces while flying
- If motor get damage it can glide and comes safely to ground

Scope for Future Work

As the future work, we are investigating some of the possibilities to use laser gun and radar in place of camera for military purposes. The use of laser gun can be very useful in military purposes. From the laser gun, the target can be pin pointed accurately and there will be less space for errors. The radar on the other hand can be used to locate any hidden objects over an area as the flying plane can take it to place where humans find it difficult to go.

This work extends to agricultural purposes. By fixing a container containing chemicals and pesticides that opens out as the plane flies over the field, which helps in spraying the chemicals. By this, time and effort is saved which results higher production and less damage to the crops.

REFERENCES

[1] Thooyamani, K.P., Khanaa, V., & Udayakumar, R. (2014). Virtual instrumentation based process of agriculture by automation. *Middle-East Journal of Scientific Research*, *20*(12): 2604-2612.

[2] Udayakumar, R., Kaliyamurthie, K.P., & Khanaa, T.K. (2014). Data mining a boon: Predictive system for university topper women in academia. *World Applied Sciences Journal*, *29*(14): 86-90.

[3] Anbuselvi, S., Rebecca, L.J., Kumar, M.S., & Senthilvelan, T. (2012). GC-MS study of phytochemicals in black gram using two different organic manures. *J Chem Pharm Res*., *4*, 1246-1250.

[4] Subramanian, A.P., Jaganathan, S.K., Manikandan, A., Pandiaraj, K.N., Gomathi, N., & Supriyanto, E. (2016). Recent trends in nano-based drug delivery systems for efficient delivery of phytochemicals in chemotherapy. *RSC Advances*, *6*(54), 48294-48314.

[5] Thooyamani, K.P., Khanaa, V., & Udayakumar, R. (2014). Partial encryption and partial inference control based disclosure in effective cost cloud. *Middle-East Journal of Scientific Research*, 20(12), 2456-2459.

[6] Lingeswaran, K., Prasad Karamcheti, S.S., Gopikrishnan, M., & Ramu, G. (2014). Preparation and characterization of chemical bath deposited cds thin film for solar cell. *Middle-East Journal of Scientific Research*, *20*(7), 812-814.

[7] Maruthamani, D., Vadivel, S., Kumaravel, M., Saravanakumar, B., Paul, B., Dhar, S.S., Manikandan, A., & Ramadoss, G. (2017). Fine cutting edge shaped Bi2O3rods/reduced graphene oxide (RGO) composite for supercapacitor and visible-light photocatalytic applications. *Journal of colloid and interface science*, *498*, 449-459.

[8] Gopalakrishnan, K., Sundeep Aanand, J., & Udayakumar, R. (2014). Electrical properties of doped azopolyester. *Middle-East Journal of Scientific Research, 20*(11). 1402-1412.

[9] Subhashree, A.R., Parameaswari, P.J., Shanthi, B., Revathy, C., & Parijatham, B.O. (2012). The reference intervals for the haematological parameters in healthy adult population of chennai, southern India. *Journal of Clinical and Diagnostic Research: JCDR*, *6*(10), 1675-1680.

[10] Niranjan, U., Subramanyam, R.B.V., & Khanaa, V. (2010, September). Developing a web recommendation system based on closed sequential patterns. In *International Conference on Advances in Information and Communication Technologies, 101,* 171-179. Springer, Berlin, Heidelberg.

[11] Slimani, Y., Baykal, A., & Manikandan, A. (2018). Effect of Cr3+ substitution on AC susceptibility of Ba hexaferrite nanoparticles. *Journal of Magnetism and Magnetic Materials*, *458*, 204-212.

[12] Premkumar, S., Ramu, G., Gunasekaran, S., & Baskar, D. (2014). Solar industrial process heating associated with thermal energy storage for feed water heating. *Middle East Journal of Scientific Research, 20*(11), 1686-1688.

[13] Kumar, S.S., Karrunakaran, C.M., Rao, M.R.K., & Balasubramanian, M.P. (2011). Inhibitory effects of Indigofera aspalathoides on 20-methylcholanthrene-induced chemical carcinogenesis in rats. *Journal of carcinogenesis*, *10*.

Received: 18 Feb 2019 | Revised: 06 Mar 2019 | Accepted: 02 Apr 2019

[14] Beula Devamalar, P.M., Thulasi Bai, V., & Srivatsa, S.K. (2009). Design and architecture of real time web-centric tele health diabetes diagnosis expert system. *International Journal of Medical Engineering and Informatics*, *1*(3), 307-317.

[15] Gupta, T., & Sharma, A. (2014). Search Accuracy in Web information Retrieval. *International Journal of Communication and Computer Technologies*, *2*(2), 98-105.

[16] Kakavand, Z.M., & Chalechale, A. (2015). Comparison of Two Different Distance Functions of Image Retrieval for Detecting Species of Microscopic Fungi in Medical Mycology Laboratory. *International Academic Journal of Science and Engineering*, *2*(4), 39-44.

[17] Ramya, V., Ranjitha, S., Sathya Sofia, A., & Ganesh Kumar, P. (2014). Load Balancing of Tasks in Cloud Computing Environment Using Honey Bee Behavior. *International Journal of System Design and Information Processing*, *2*(2), 25-53.

[18] Brindha, M.S. (2017). A Survey on Cross Layer Distributed Topology Control in Mobile Adhoc Network. *Bonfring International Journal of Networking Technologies and Applications*, *4*(1), 1-3.

[19] Kumar, P. (2014). Load Characteristics of Electric System for Distributing Power on Locality Based Criterion. *Bonfring International Journal of Power Systems and Integrated Circuits*, *4*(4), 39-43.

[20] Rama Rao, G., Purna Prakash, J., & Rama Raju, M. (2014). Designing High to Low Cost Solution for Crash Recovery of Servers through Virtualization using Cloud Computing. *International Scientific Journal on Science Engineering & Technology*, *17*(5), 549-555.

[21] Arul Jothy, K., Sivakumar, K., & Delsey, M.J. (2018). Distributed System Framework for Mobile Cloud Computing. *Bonfring International Journal of Research in Communication Engineering*, *8*(1), 5-9.

[22] Kabeer, V., & Zainul Abid, T.P. (2013). Automated Face Recognition using Artificial Light Receptor Model and SVM Classifier. *The SIJ Transactions on Computer Science Engineering & its Applications*, *1*(3), 36-41.

[23] Yasvanthkumaar, V., Sabitha, S., & NithyaKalyani, S. (2018). Parallel and Multiple E-Data Distributed Process with Progressive Duplicate Detection Model. *Bonfring International Journal of Software Engineering and Soft Computing*, *8*(1), 23-25.

[24] Kanaga Sundar, R., Joe Paul, J., Krishna Kumar, M., & Laser, L. (2014).Secured POR for Flooding Attack Prevention in Extremely Dynamic Ad Hoc Networks. *The SIJ Transactions on Computer Networks & Communication Engineering (CNCE)*, *2*(2), 5-9.

[25] Ravichandran, A.T., Srinivas, J., Karthick, R., Manikandan, A., & Baykal, A. (2018). Facile combustion synthesis, structural, morphological, optical and antibacterial studies of Bi1− xAlxFeO3 (0.0≤ x≤ 0.15) nanoparticles. *Ceramics International*, *44*(11), 13247-13252.

[26] Thovhogi, N., Park, E., Manikandan, E., Maaza, M., & Gurib-Fakim, A. (2016). Physical properties of CdO nanoparticles synthesized by green chemistry via Hibiscus Sabdariffa flower extract. *Journal of Alloys and Compounds*, *655*, 314-320.

[27] Thooyamani, K.P., Khanaa, V., & Udayakumar, R. (2014). Wide area wireless networks-IETF. *Middle-East Journal of Scientific Research*, *20*(12), 2042-2046.

[28] Sundar Raj, M., Saravanan, T., & Srinivasan, V. (2014). Design of silicon-carbide based cascaded multilevel inverter. *Middle-East Journal of Scientific Research*, *20*(12), 1785- 1791.

[29] Achudhan, M., Jayakumar M.P. (2014). Mathematical modeling and control of an electrically-heated catalyst. *International Journal of Applied Engineering Research*, *9*(23), 23013.

[30] Thooyamani, K.P., Khanaa, V., & Udayakumar, R. (2013). Application of pattern recognition for farsi license plate recognition. *Middle-East Journal of Scientific Research*, *18*(12), 1768-1774.

[31] Jebaraj, S., Iniyan S. (2006). Renewable energy programmes in India. *International Journal of Global Energy Issues*, *26*(43528), 232-257.

[32] Sharmila, S., & Jeyanthi Rebecca, L. (2013). Md Saduzzaman., Biodegradation of domestic effluent using different solvent extracts of Murraya koenigii. *J Chem and Pharm Res*, *5*(2), 279-282.

[33] Asiri, S., Sertkol, M., Guner, S., Gungunes, H., Batoo, K.M., Saleh, T.A., Manikandan A., & Baykal, A. (2018). Hydrothermal synthesis of CoyZnyMn1-2yFe2O4 nanoferrites: magneto-optical investigation. *Ceramics International*, *44*(5), 5751-5759.

[34] Rani, A.J., & Mythili, S.V. (2014). Study on total antioxidant status in relation to oxidative stress in type 2 diabetes mellitus. *Journal of clinical and diagnostic research: JCDR*, *8*(3), 108-110.

[35] Karthik, B. (2014). Arulselvi, Noise removal using mixtures of projected gaussian scale mixtures. *Middle-East Journal of Scientific Research*, *20*(12), 2335-2340.

[36] Karthik, B., Arulselvi, & Selvaraj, A. (2014). Test data compression architecture for low power VLSI testing. *Middle - East Journal of Scientific Research*, *20*(12), 2331-2334.

[37] Vijayaragavan, S.P., Karthik, B., & Kiran Kumar, T.V.U. (2014). Privacy conscious screening framework for frequently moving objects. *Middle-East Journal of Scientific Research*, *20*(8), 1000-1005.

[38] Kaliyamurthie, K.P., Parameswari, D., & Udayakumar, R. (2013). QOS aware privacy preserving location monitoring in wireless sensor network. *Indian Journal of Science and Technology*, *6*(5), 4648-4652.

[39] Silambarasu, A., Manikandan, A., & Balakrishnan, K. (2017). Room-temperature superparamagnetism and enhanced photocatalytic activity of magnetically reusable spinel ZnFe 2 O 4 nanocatalysts. *Journal of Superconductivity and Novel Magnetism*, *30*(9), 2631-2640.

[40] Jasmin, M., Vigneshwaran, T., & Beulah Hemalatha, S. (2015). Design of power aware on chip embedded memory based FSM encoding in FPGA. *International Journal of Applied Engineering Research*, *10*(2), 4487-4496.

[41] Philomina, S., & Karthik, B. (2014). Wi-Fi energy meter implementation using embedded linux in ARM 9. *Middle-East Journal of Scientific Research*, *20*, 2434-2438.

[42] Vijayaragavan, S.P., Karthik, B., & Kiran Kumar, T.V.U. (2014). A DFIG based wind generation system with unbalanced stator and grid condition. *Middle-East Journal of Scientific Research*, *20*(8), 913-917.

[43] Rajakumari, S.B., & Nalini, C. (2014). An efficient data mining dataset preparation using aggregation in relational database. *Indian Journal of Science and Technology*, *7*, 44-46.

[44] Karthik, B., Kiran Kumar, T.V.U., Vijayaragavan, P., & Bharath Kumaran, E. (2013). Design of a digital PLL using 0.35 Î¼m CMOS technology. *Middle-East Journal of Scientific Research*, *18*(12), 1803-1806.

[45] Sudhakara, P., Jagadeesh, D., Wang, Y., Prasad, C.V., Devi, A.K., Balakrishnan, G., Kim B.S., & Song, J.I. (2013). Fabrication of Borassus fruit lignocellulose fiber/PP composites and comparison with jute, sisal and coir fibers. *Carbohydrate polymers*, *98*(1), 1002-1010.

[46] Kanniga, E., & Sundararajan, M. (2011). Modelling and characterization of DCO using pass transistors. In *Future Intelligent Information Systems*, 86(1), 451-457. Springer, Berlin, Heidelberg.

[47] Sachithanandam, P., Meikandaan, T.P., & Srividya, T. Steel framed multi storey residential building analysis and design. *International Journal of Applied Engineering Research*, *9*(22), 5527-5529.

[48] Kaliyamurthie, K.P., Udayakumar, R., Parameswari, D., & Mugunthan, S.N. (2013). Highly secured online voting system over network. *Indian Journal of Science and Technology*, *6*(S6), 4831-4836.

[49] Sathyaseelan, B., Manikandan, E., Lakshmanan, V., Baskaran, I., Sivakumar, K., Ladchumananandasivam, R., Kennedy, J., & Maaza, M. (2016). Structural, optical and morphological properties of post-growth calcined TiO2 nanopowder for opto-electronic device application: Ex-situ studies. *Journal of Alloys and Compounds*, *671*, 486-492.

[50] Saravanan, T., Sundar Raj M., & Gopalakrishnan K. (2014). SMES technology, SMES and facts system, applications, advantages and technical limitations. *Middle - East Journal of Scientific Research*, *20*(11), 1353-1358.