International Research Journal of Engineering and Technology (IRJET) e-ISSN: 2395-0056
Volume: 08 Issue: 06 | June 2021 www.irjet.net p-ISSN: 2395-0072

A LITERATURE SURVEY ON: WALKING AID STICK FOR VISUALLY CHALLENGED PEOPLE

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Abstract**—***Today' technology is growing to a bigger extent, but there's no price effective device for visually impaired folks. The sensible stick can have sensors embedded with it, thereby it senses the objects/intruder, once associated with objects or obstacles are available in vary of an supersonic device then the person is alerted with a fast reaction time employing a vibrator and voice alert to his/her Speakers module. The general system conjointly encompasses a GPS module, so the person with incapacity will recognize this location with the assistance of an electro-acoustic transducer and a speaker. The proposed system will also be integrated with a RaspberryPi Camera which can identify the objects that appear before him/her. The system is trained using the Deep Learning algorithm- CNN, which will be capable of identifying the objects. This technique conjointly has a feature provided to the impaired to contact his/her family whose range is kept in an exceedingly microcontroller just in case of any emergency. The emergency message using GSM will contain the blind persons' details such as: location. Coming up with a price effective and economical blind stick is the main aim of the project.*

Index Terms: - Speakers, Sensible Blind Stick, RaspberryPi, RaspberryPi Camera, CNN Algorithm, GPS and GSM.

1. INTRODUCTION

Blindness is a very common disability among the peoples throughout the world. According to the World Health Organization (WHO) 285 million people are visually impaired worldwide, 39 million are blind and 246 have low vision. About 90% of the world's visually impaired live in developing countries [1]. To be classed as blind, there is a total loss of vision. Low vision cannot be corrected by visual aids such as glasses and contacts [2]. For the indigents blindness is a curse. They need help to walk outside and all other daily essential works. So the proposed work glows a system that tries to remove the curse of blindness and make them self dependent to do their daily chores. It is a walking stick, normally used by the blinds. But it is fully automated, easy to maintain, cheap and it is very comfortable to use [3].

The smart cane is an alternative to the common/traditional walking stick, which is a purely mechanical device used to detect ground obstacles, including holes, steps, uneven surfaces, and other things that may pose a danger. The traditional white cane is inexpensive and very lightweight and small, which makes it foldable able to fit in a pocket. Though useful, the traditional white cane has some critical setbacks, including the fact it takes hard training for one to be able to use them effectively. This is a significant "hidden" cost. Further, it only conveys a limited amount of information and allows a limited range of motion because the user can only scan the small area ahead of him/her and objects can only be detected through contact. This can be inconvenient to a traveler and those around him/her, for instance, if one is traveling in a crowded street. In the case of guide dogs [4], albeit these can be capable guides for the blind, they need extensive training. Moreover, a fully trained guide dog can cost anywhere from $12,000 to $20,000, which is quite high, considering that their useful life is only about five years.

2. EXISTING SYSTEM

2.1 Smart Walking Stick- an electrical approach to assist visually disabled people

Mohammad Hazzaz Mahmud, Rana Saha, and Sayemul Islam [5] proposed a microcontroller based automated hardware that can corroborate a blind to detect

obstacles in front of him/her.

The walking stick proposed by the team is a stick that consists of a circuit board that contains a PIC microcontroller, a LED for indication, input from micro pager motor, inputs from sensors that are installed at proper position of the stick as given in Fig. 1. All sensors data are taken by the microcontroller and can produce different pulse width modulation (PWM) based on the sensors output to operate pager motor.

Equipments used:

- Microcontroller- PIC16F690
- Ping Sonar Sensor
- GH- 311 Ultrasonic sensors
- Vibrator Motor

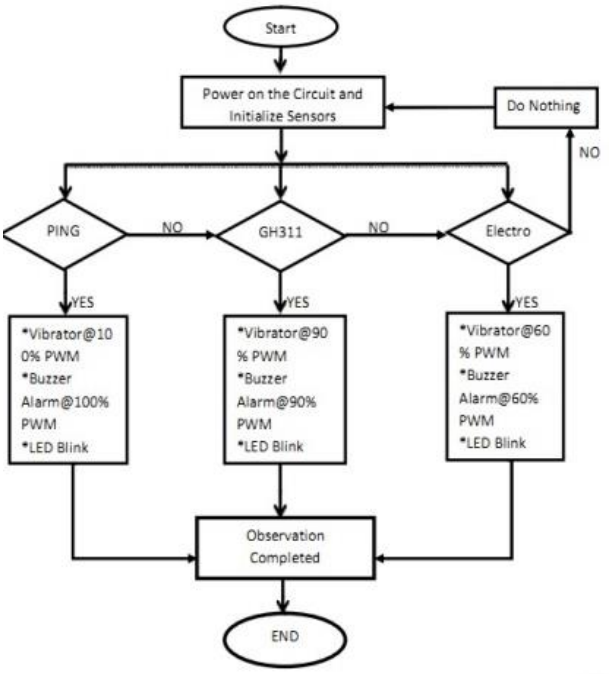

Fig 1: Flowchart of the designed system

Advantages:

- The microcontroller can be code protected; its security bridge cannot be overridden except the vendor or owner.
- Overall manufacturing cost is low and parts are available in both local and international market

Disadvantages:

- Does not have rechargeable battery mechanism. Thus it requires frequent power supply.
- Microcontroller can run only one program at a time, unlike RaspberryPi which is multi-programmable.
- The system uses vibrating motor as an indicator which is an outdated approach as many other modules can be implemented.
- Microcontroller has no internal memory storage. Thus no external data can be stored.

2.2 Smart Stick for Blind People

Manikandan Shanmugam, John Victor, Mayank Gupta and Saravanakumar [6] proposed a blind stick for the blind people using the Arduino UNO board. The stick consists of sensors and location tracking module. The location module will have the track of the route they travel with the help of GPS. If the blind person is in any kind of problem or feel struck/ lost, they only need to press the button in their smart blind man stick and with the help of GPS their close ones will get their latitude and longitude through which they can be found easily.

Equipments used:

- Recognizer Module
- GPS Module
- GSM Module
- Arduino UNO
- Ultrasonic sensors

Advantages:

- The GSM and GPS module serves as an add-on advantage for the proposed system.
- Arduino UNO does not require any additional programmer to write the code.

Disadvantages:

- Arduino is limited to small number of MCUs.
- Arduino IDE libraries are not very efficient.
- Only Ultrasonic sensors are used, which makes the stick vulnerable in many ways.
- As GPS module is put into use, it requires internet services to operate.

2.3 Smart Blind Stick using LDR and Ultrasonic sensor

Ms. S Rajeswari and Mrs. Niraja P Rayen [7] proposed this system where ultrasonic sensor is used to

detect obstacles without touching it using ultrasonic waves generated by the ultrasonic sensor.

On sensing obstacles the sensor passes the data to the microcontroller and calculates if the obstacle is close enough. If the obstacle is far the circuit does nothing but if the obstacle is close the microcontroller sends a signal to sound a buzzer. Ultrasonic sensor is used to detect any obstacle in front of blind person. It has Detection Distance of 2cm-450cm so whenever there is some obstacle in this range it will alert the blind person. The darkness and light can be detected by using the LDR sensor. An LDR or light dependent resistor is also known as photo resistor, photocell, and photoconductor.

Equipments used:

- Arduino UNO
- Battery (9V)
- Ultrasonic sensor
- LDR sensor
- Buzzer

Advantages:

- The stick proposed has used the LDR sensors, which helps the blind person to detect the light around him/her.
- The proposed system also has made use of batter of 9V, which in turn reduces the constant requirement of providing the power supply.

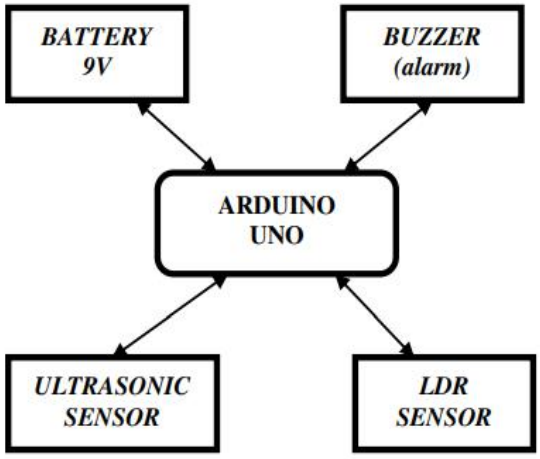

Fig 2: Overall model of the system

Disadvantages:

- Arduino UNO board has limited libraries.
  The programming language is confined to C/C++, as Arduino is programmed in C/C++.
- The system used only buzzer as the mode of indication.
- The programming language used, i.e. C/C++ is not completely object oriented programming language.

2.4 Smart Walking Stick for Blind Integrated with SOS Navigation System

Saurav Mohapatra, Tanish Saxena, and Yepuganti Karuna [8] developed a system to make the lives of blind people much easier. The project helps the blind people identify obstacles and make their next movement according to the presence or absence of the objects. In any emergency encountered by the blind person, he/she can press the eSOS app button.

The app will enable the stick with the process of live video streaming of the system. The live streaming will indicate the nearby environment of the blind person. The streaming signal with location of the blind person is sent to the respected family members' Android phone via an Android application. The stick is in-built with an ultrasonic sensor with a microcontroller. The microcontroller works together with ultrasonic sensor. The ultrasonic sensor is used to detect the obstacles.

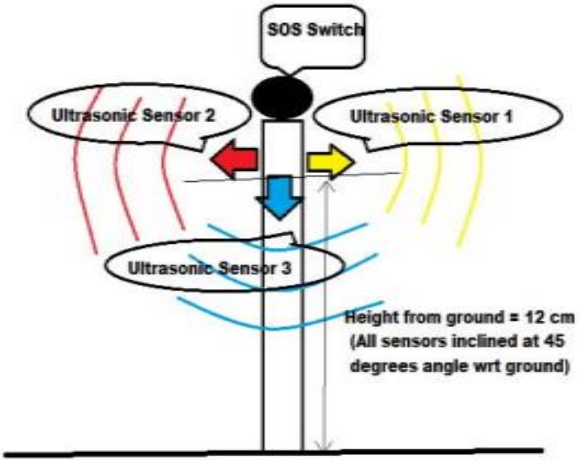

Fig 3: System Design

Equipments used:

- RaspberryPi 3
- RaspberryPi Camera
- Ultrasonic sensor
- SOS Button
- SOS App.

Advantages:

- Location of the blind person is sent to his family members in case of emergency.
- The proposed system is integrated with an Android application.

Disadvantages:

- The system requires constant supply of internet, as all the working applications run on network connection.
- As the system provides a process of live streaming it requires a constant power supply.
- The live video streaming concept might look advantageous, but it may have its own set of disadvantages.
- Sometimes the live video may not serve to its fullest to help the family members of the blind person in finding him/her.

2.5 Smart Blind Stick for Visually Impaired People

Ashish Kumar and Reeta Verma [9] proposed this system which presents the Electronic travel Aid (ETA) i.e. the electronic smart stick which guides the blind person by a buzzer which beeps when the ultrasonic sensors, infrared sensor detects any obstacles present in its way. The smart stick presented here also incorporates the LDR sensor and the water sensor for detection of the dark by the LDR and the potholes filled with water by the water sensor. The stick proposed has an additional feature which is that it cannot be easily displaced by the blind person. It contains a RF receiver which receives the radio signal of 433 MHz when the user displaces it with the help of a remote containing the transmitter.

Equipments used:

- Water Detection Sensor
- Ultrasonic Sensor NCSR04
- Light Dependent Resistor (LDR)
- Infrared Sensor
- 433MHz Receiver Transmitter Module.

Advantages:

- Ultrasonic sensor and IR sensor will be detecting obstacles with the help of a buzzer and a vibrating motor.
- Water sensor will detect water to acknowledge the blind person about the water on the surface.

Disadvantages:

- A remote containing transmitter is used to find the displace stick. There are possibilities of remote being displaced.
- LDR sensor might get into used only when the blind person toggles the button, otherwise it is not functional.
- The use of LDR sensor might sometimes mislead the visually impaired person if he/she is using the blind stick at the night time.
- The stick if displaced can be found only in certain range of signals, otherwise the blind person will not be able to find his stick.

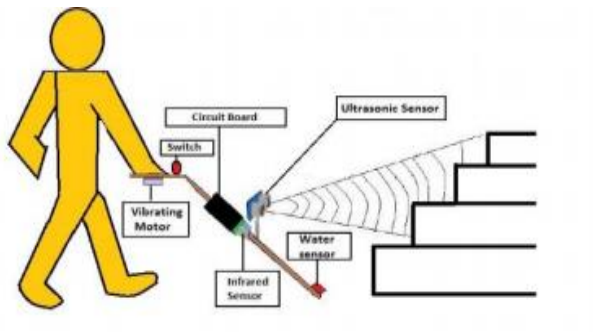

Fig 4: Proposed Stick Illustration

2.6 Smart Cane for Visually Impaired

Sukriti Sudhakar [10] proposed a smart cane in this system, it has sensors embedded on it, thereby it senses the obstacles/ intruder, when any object come in range of an ultrasonic sensor. Then the person is alerted

with a quick response time. This System also has a water sensor at the bottom of the stick and Infrared sensor for effective obstacle detection. Smart cane is an innovative blind stick which is designed for visually impaired people for improved navigation. The smart cane is embedded with light and water sensors along with ultrasonic sensor .These Ultrasonic sensors use to detect obstacles ahead by using ultrasonic waves.

Equipments used:

- ATmega328P Microcontroller
- HC-SR04 Ultrasonic Sensor
- LDR Sensor
- Crystal Oscillator
- LEDs
- Buzzer

Advantages:

- The system detects obstacles and alerts the blind person through buzzers and be easily used for navigation.
- The sensor detects whether there is a light or not in the room.

Disadvantages:

- Device developed here is of low budged which leads to compensation of more advanced features in the system.
- The microcontroller used has limited number of pins for any connections.
- The microcontroller will have no storage provided explicitly.

2.7 Assistive Voice Alert Based Smart Stick for Blind People with GPS

S. Munirathnam and S. Amruthavalli [11] proposed a device which can be utilized for controlling people who are blind or incompletely located. The device is utilized to help blind individuals. The proposed navigation system in this system comprises of:

- Sensing of the quick encompassing condition against obstacles utilizing ultrasonic sensor with a separation scope of 20 cm.
- Warning about the obstacles utilizing voice playback module with the voice summon as “obstacle alter course”.
- It can even track the area of the client utilizing GPS API scratch and the area of the client will be insinuated to the guardian utilizing the area outline Blynk application in overseer portable.
- It uses LDR sensor and soil moisture sensor to detect light and moisture.

Equipments used:

- NODEMCU ESP8266_12E
- Ultrasonic and LDR sensor
- Soil Moisture Sensor
- Voice Playback Module
- Blynk Cloud App.

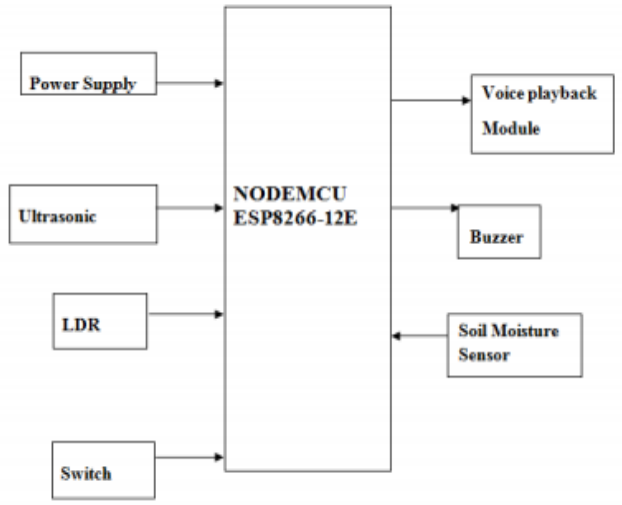

Fig 7: Block Diagram of Developed System

Advantages:

- Warning about the obstacles utilizing voice playback module.
- Track the area of the client utilizing GPS.

Disadvantages:

- As the proposed system makes use of an application. Thus it requires good and continuous internet connectivity.
- As the application is associated with cloud, it

requires cloud storage.

2.8 Blind Man Stick Using Programmable Interrupt Controller (PIC)

Anuj Parikh, Dhvani Shah, and Krupa Popat [13] with their Prof. Harish Narula proposed a blind man stick that can detect obstacles, potholes and thus help the blind person travel independently.

The system is constructed using ultrasonic sensors, a Programmable Interrupt Controller (PIC 16F877A) that has an On-chip Analog-to-Digital Converter (ADC), a vibrator, buzzer and a power supply. The software used in this system includes Embedded 'C', Pickit 2 Programmer, MPLAB. This system allows them to change their direction. However additional information about the shape, width etc of the object will allow them to avoid these obstacles more efficiently. Ultrasonic sensor is used to measure the distance of the object it is attached to the stick.

Equipments used:

- Ultrasonic Sensor
- Accelerometer Sensor
- Programmable Interrupt Controller
- Buzzer
- Battery

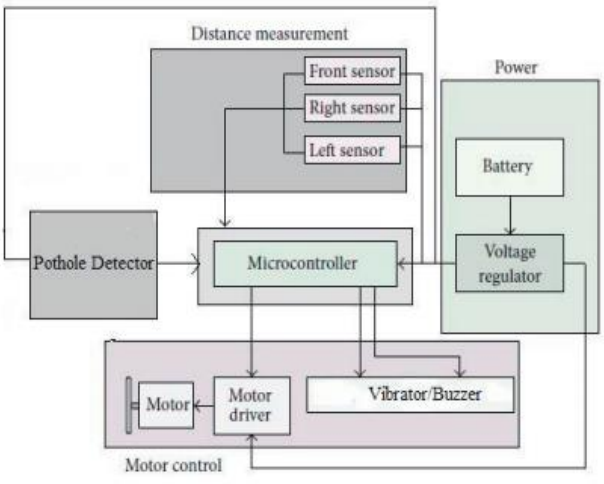

Fig 8: Block Diagram of the System

Advantages:

- This system is capable of detecting potholes.
- Sensors have been utilized fully to ensure safe and secure mobility of the visually impaired people.

Disadvantages:

- The stick must actually be over the potholes for it to detect the pothole.
- Microcontrollers are capable of executing one program at a time.
- As the system involves many motors in it, it will require quite a bulky amount of power supply.

3. PROPOSED SYSTEM

The proposed system makes use of RaspberryPi B module, RaspberryPi Camera that makes the system efficient, and conjointly this system contains a demand to capture plenty of images/frames per second that will increase the necessity for giant storage. The key agenda of this project is to develop a value effective economical system. The stick is embedded with Raspberry Pi, Front Camera, GSM module, GPS module, vibrator, switches and sensors. If any device is invoked, the vibrator that is placed over the handle vibrates.

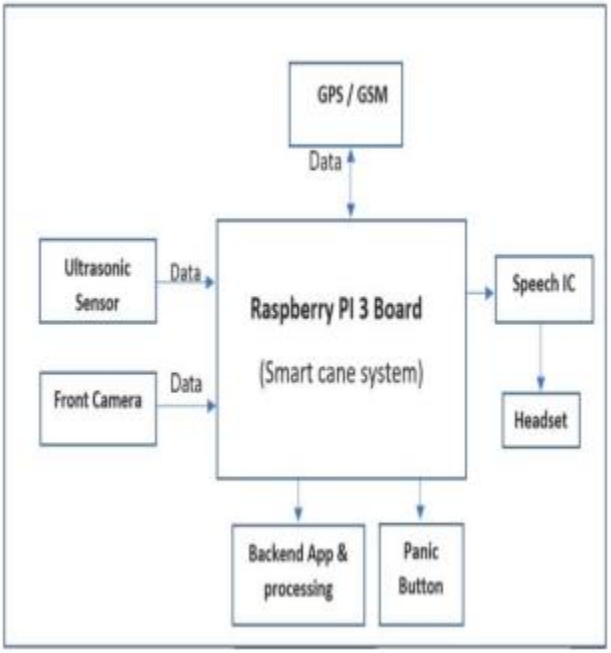

Fig 7: The block diagram of the proposed system

If the visually impaired person needs to grasp their current location they'll press the switch assigned for that purpose, associate degree audio relating to this location is detected by the blind man with the help of speakers as an audio device. Totally different types of devices like Ultrasonic device and Infrared device are placed at numerous elements of the stick creating it strong. If the visually impaired person conjointly needs some facilitate throughout some emergency, a decision or a message is shipped to a group of mobile numbers hold on during a small controller.

Developing the merchandise at bottom value becomes the key agenda of the project. If the person wants to grasp the directions to induce to the proper location, he/she will really press a button associated for the aim, the direction based mostly audio message is detected by them victimization the Speakers based audio device. Infrared device that is gift at rock bottom of the stick will find presence of holes and stairs.

The system will be trained using the Deep Learning concept: CNN (Convolution Neural Networks) Algorithm, so that it will be capable to identify the objects the blind person comes across. The RaspberryPi Camera will capture images and will be processed to identify the respective object.

4. CONCLUSION

The proposed system tends to provide an effective and cost efficient walking aid stick for the visually impaired people. When a blind person wants travel the outside world without any assistance and humane support, he can make use of the blind stick as a walking aid. The blind stick has basic sensors like Ultrasonic sensor and Infrared sensor which makes the stick stronger to use. The proposed system is trained using the CNN algorithm to identify different objects. The system will also have GPS and GSM to assist the blind person.

In case of any emergency the blind person can press the emergency button to send an emergency message to his family member. The emergency message will contain the location of the blind person. All these modules will work alongside the RaspberryPi 3B Module, which is a mini computer. The mode of alert will be through a buzzer and the Speaker module.

The model proposed will be a complete automated system, which will be effective and affordable. The blind person can rely on the blind stick to carry his/her day-to-day activities indoors and outdoors.

5. ACKNOWLEDGEMENT

The authors would like to express sincere thanks for constant support and encouragement that is provided to us by the Management of RRGI and Principal, RajaRajeswari College of Engineering, Bengaluru- 74, Karnataka, India during this research work.

6. REFERENCES

[1] https://www.who.int/en/news-room/fact-sheets/detail/blindness-and-visual-impairment.
[2] 4816.0.55.001 - Occasional Paper: Long-term Health Conditions - A Guide To Time Series Comparability From The National Health Survey, Australia, 2001 (abs.gov.au)
[3] Johann Borenstein and Yoram Koren, “The Guide Cane –A computerized Travel aid for the Active Guidance for the Blind Pedestrians”, proceedings of the IEEE international conference on Robotics and Automation, Albuquerque, April 1997.
[4] Shraga Shoval, Iwan Ulrich, and Johann Borenstein, “Navelbelt and Guidecane”, Article for the IEEE Robotics and Automation Magazine, Special Issue on Robotics in Bio-Engineering, Volume 10, No. 1, March 2003, pp. 9-20.
[5] Mohammad Hazzaz Mahmud, Rana Saha, and Sayemul Islam, “Smart walking stick - an electronic approach to assist visually disabled persons”, International Journal of Scientific & Engineering Research, Volume 4, Issue 10, October-2013.
[6] Manikandan Shanmugam, John Victor, Mayank Gupta and Saravanakumar, “Smart Stick for Blind People”, Special Issue Published in International Journal of Trend in Research and Development (IJTRD), ISSN: 2394-9333.
[7] Ms. S Rajeswari and Mrs. Niraja P Rayen, “Smart

Blind Stick using LDR and Ultrasonic sensors", International Journal of Advanced Research in Basic Engineering Sciences and Technology (IJARBEST), Vol.4, Issue.11, November 2018, ISSN: 2456-5717.

[8] Saurav Mohapatra, Tanish Saxena, and Yepuganti Karuna, "Smart Walking Stick for Blind integrated with SOS Navigation System", Proceedings of the 2nd International Conference on Trends in Electronics and Informatics (ICOEI 2018) IEEE Conference Record: # 42666; IEEE Xplore ISBN: 978-1-5386-3570-4.

[9] Ashish Kumar and Reeta Verma, "Smart Blind stick for Visually Impaired People", International Journal of Research in Electronics and Computer Engineering (IJRECE), Vol. 6, Issue 2, Apr - June 2018, ISSN: 2348-2281.

[10] Sukriti Sudhakar, "Smart Cane for Visually Impaired", International Journal of Engineering Science and Computing, August 2018.

[11] S. Munirathnam and S. Amruthavalli, "Assistive Voice Alert Based Smart Stick for Blind People with GPS", International Journal of Engineering Trends and Applications (IJETA) – Volume 5 Issue 2, Mar-Apr 2018.

[12] Anuj Parikh, Dhvani Shah, and Krupa Popat, "Blind Man Stick Using Programmable Interrupt Controller (PIC)", International Conference on Advanced Computing Technologies and Applications (ICACTA2015).