

Smart Multiuser Charging Station-Technical Review

B. D. Deore¹, S. R. Kurkute², P. R. Ghatol³, V. S. Vaidya⁴, S. H. Ansari⁵

Assistant Professor, Department of Electronics & Telecommunication, SIEM, Nashik, India ^{1,2}

Student, Department of Electronics & Telecommunication, SIEM, Nashik, India ^{3,4,5}

Abstract: In today's technological era with developing in technology the use of electronics devices also increases. The use of high-tech electronic devices makes the system more efficient which results in improvement in productivity as well as reduces the time factor. One of the most essential electronic devices is cell phone which gives the connectivity to the entire world. For the gracefully utilisations of electronic device it is very essential to maintain the power requirement of electronic device. In privet area is it easy to maintain this power requirement but in public area such as in travelling or in outside filled many time it is some what difficult to fulfil the power requirement. One of solution given by some researcher is portable charging station. The important factor which has been taken care is security of electronic devices during charging. In this paper we are going to discuss different system for charging of electronic devices especially cell phone along with the technology used for giving a proper security to device.

Keywords: Biometric, arduino, compartment, fingerprint.

I. INTRODUCTION

Now day's mobile phones are most common and use full electronic device in the field of communication. Day by day many researchers are working on developing applications using IoT's and all to make strong communication channels. Inline to operate all such applications power requirement increases. The best solution for fulfilling power requirement of cell phone is either improving power storing capacity of batter's or by making availability of mobile charging stations. So now days it is very essential to have invention is in technical field of multi-cellular charging stations for electronic devices. Most cell phone chargers are not really chargers, they are only a power adaptor that provide power source for the charging circuitry which always contained within the mobile phone. Is even easy to provide more charging sockets in privet area but for public areas such as Organization, Schools, Colleges, Hotels, Water Parks, Gyms, Malls, Bus Top, and Railway Station the charging station must have some security aspect. With the same aspect the invention, a charging station must have a plurality of individual charging lockers. Each of the charging lockers is provided with various types and kinds of connectors to connect matching charging port. The use of portable electronic devices is found in modern society. Therefore it is common to see the device being carried a used by persons in most public vicinity. It has even become common for coffee houses and other establishments to actually block or cover once existing electrical outlets. For this reason, we are developing for an alternative to facilitate charging devices in public areas. There are lack of existing and prior art there is no charging stations for public use that are secure. It is all too common in the public areas, specially for the organization, schools, colleges, hotels, water parks, gyms, malls and coffee shops for the purpose of dedicated users. The powering means also comprises at least one standard electrical plug for connecting the charging station to an electrical outlet in the environment. Each cell phone can be attached by at least one attaching charging cord of the charger. The biometric scanner associated with the system which provides the security of cell phones when they are inside of the locker units. According to the availability of locker unit, the locker's doors are open for charging based on priority. The user then opens the door on the available cell and thereby exposes compartment and put the cell phones inside the station and confirmation done. The user then places the electronic devices inside the interior compartment and closes the door. After waiting for an electronic device to complete the desired charging cycles, the user retrieves the electronic device by scanning particular fingerprint the door will open. Detaches the cell phone device i.e. cell phones from the charging means, and removes the electronic devices from the interior compartment. Finally, the user closes the door of the locker or compartment.

II. LITERATURE REVIEW

Grant sanders published paper on "Recharging system for personal electronic devices", This invention relates generally to the recharging of personal electronic devices, such as cell phones, lap top and palm top computers, personal digital assistants, and the like, and more particularly to a facility for securely receiving and recharging such devices upon the receipt of a prescribed fee. The invention further relates to the recharging of personal electronic devices in hotel rooms, motel rooms, and similar venues [1].

Yash Mittal, Aishwary Varshney and Prachi Aggrawal published paper on "Fingerprint biometric based access control and classroom attendance management system", describe an idea to developed and implemented the management system in which the fingerprint recognition biometric technology used to develop an Access control

system to automate the entry and exit control in education institutions as well as homes and offices. Fingerprint sensors may be placed at various access points in institutions to control access. This paper is published in India Conference (INDICON), 2015 Annual IEEE [5].

Jack standish Phelps and Adam H. Johnson published paper on “Managing The Use Of Secure Compartments in charging stations for Portable Electronic Devices”, gives a method for operating a charging station for a portable electronic device, comprising: obtaining input from a user to the charging station; and if the input matches an ongoing transaction associated with charging of the portable electronic device by the charging station: using the input to identify a first secure compartment of the charging station containing the portable electronic device, Where power is supplied to the portable electronic device Within the first secure compartment; releasing a first door of the first secure compartment; and upon detecting a presence of the portable electronic device in the first secure compartment after the first door is subsequently closed, securing the first door and continuing to supply power to the portable electronic device Without requiring additional input from the user [3].

James Mullin, James Conrad and Daryle Bobb published paper on “Multiple Kiosks for Rental of Securable Devices”, which gives an idea to developed new system to charge cell phones of specific users. This system involved the user may select a locker or other securable device, make a payment for a rental period, and either obtain or enter a personal identification number (“PIN”) for the assigned locker. Alternately, some known systems have employed electronic RFID based tokens in place of user codes. Once the user has completed a rental transaction, the user may be directed to proceed to the assigned locker which the system has enabled for use. Thereafter, each time the user wants to access the locker, the user must first proceed to the kiosk, enter the PIN or scan the personal RFID tag and only then proceed to his or her locker. The user is normally allowed to access the locker frequently during their rental period. A standard analog Servo Motor is used for locking/unlocking the door by turning at approximately 90°. It is tightly wrapped around the door’s lock (i.e., the servo horn gets a tight grip with the lock), when servo motor rotates 90° for locking. When the fingerprint gets validated, the microcontroller (Arduino) sends control signal to the Servo Motor to rotate it back by 90° so as to unlock the door. This research uses the RFID card and Personal Identification Number for authentication purpose which limits the system for the users who hold the RFID card for selected locker. Any unauthorised user can use this RFID card which lead to purloined of cell phones. This limitation is overcome in “smart charging station” [10].

Stephen collins and Suzzane Collins published the paper on “Charging Cabinet”, This present invention provides a charging cabinet for holding and charging small electronic devices. Such a charging cabinet will have at least one shelf on Which users may place small electronic devices, a housing to contain the at least one shelf, a plurality of power outlets that Will deliver power to the devices, and a cord that plugs into an external power source and delivers power to the internal power outlets. This charging cabinet will provide users to charge and store multiple small electronic devices without dedicating valuable desk or counter space, or multiple house hold power outlets to the devices. Using a charging cabinet will also eliminate clutter created by multiple small electronic devices being stored or charged on a desk or on a counter in a kitchen or bathroom. The charging cabinet will eliminate the safety concerns of loose power cords by allowing them to be contained inside the charging cabinet [7].

III.METHODOLOGYS

A. Recharging system for personal electronic devices using pin-code

As per brief in literature the author has implemented a system for as recharging station with use of pin-code for security purpose using microprocessor. The microprocessor is adapted to recognize a particular personal electronic device that is connected to the charging station Fig shows basic block diagram of implemented system [1]. Near field communication can also be used for improving the security of system [8]

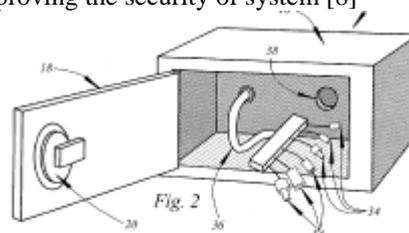


Fig.1.Implemented system bracket

B) Managing the Use of Secure Compartments in charging stations for Portable Electronic Device

In this paper the RFID technology is used. Charging station include a display, a card reader, and a set of secure compartments. Charging station may be configured to charge a number of portable electronic devices, such as mobile phones, personal digital assistants (PDAs), tablet computers, portable media players, and/ or other battery-powered electronic devices. This system uses the RFID card for the purpose which limits the system for the users who hold the

RFID card [3].RFID card GSM technology can also be use for sending message to user about the details of locker [4]. PIC or Arm processor can be used for implementation of such system but this type of processor has some limitations as discussed in [6][13].

C) Multiple Kiosks for Rental of Securable Devices

This system assigning controlled access to a securable device may include multiple securable devices available for a user to rent. Arterial limitation of this system is that it is not free for every user; they need to pay some fee to use Securable Charging Device. This research uses the RFID card and Personal Identification Number for authentication purpose which limits the system for the users who hold the RFID card for selected locker. Any unauthorized user can use this RFID card which lead to purloined of cell phones [10].

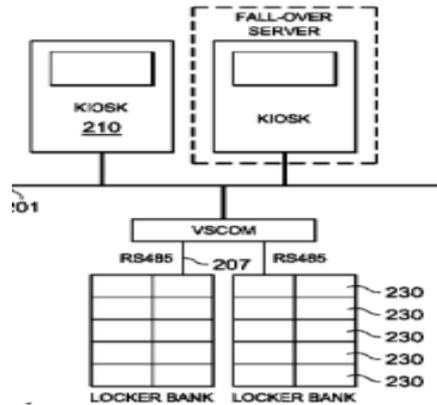


Fig.2. Kiosk System

D) Biometric Smart Multiuser Charging Station

To overcoming all above limitations and drawback the Biometric Smart Multiuser Charging Station will be the best solution. This system will use full even for illiterate and blind peoples. The security and authentication provided by biometric fingerprint sensor. Every person has unique fingerprint so anyone can easily get advantage of biometric smart multiuser charging station. The block diagram of the system is as shown in below figure3.

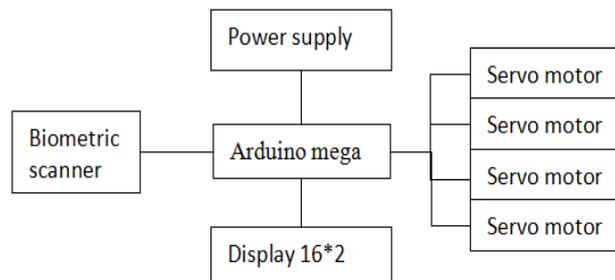


Fig.3. Biometric Smart Multiuser Charging Station

● Biometric sensor

Biometric is the process of identifying a person depending on their physiological or behavioural characteristic. Biometric data is unique and distinct from personal information. This biometric data cannot be reverse-engineering to recreate personal information and they cannot be stolen. Fingerprint identification involves scanning an image using fingerprint sensor which is digitally compared with a previously stored image of fingerprint. The fingerprint sensor sees whether the loops, whorls and curves have any similarities of previously stored image. Important point to be noted is fingerprint sensor doesn't stored complete image of your fingerprint. It only stored information in binary numbers.

● Servo motor

Servo motor is a tiny and lightweight which provide high output power. Servo motor can rotate approximately in 180 degrees. By using any servo code, hardware or library it is possible to control servo motors. Size of servo motor is tiny, so it will fit in small places. Servo motor has 3 horns (arms) and hardware.



Fig. 4. Servo motor

- *LCD Display*

LCD (Liquid Crystal Display) is a 16*2 electronics display used for wide range application. LCD 16*2 display used in various application such as display some information in the form of alphabets and digits. 16*2 LCD display means it shows 16 characters in 2 lines. i.e. per character it display 5*7 pixel matrix. Display circuitry contains two register command and data. Command instruction is used to store the instruction which is given to LCD display. Data register is used to store data which is to be displayed on the LCD16*2 screen. The data is in the form of ASCII value of the character to be displayed on the LCD.

- *Arduino*

The Arduino Mega 2560 is a microcontroller board based on the AT mega 2560. The Arduino Mega 2560 is advanced version of a Arduino uno. Arduino Mega 2560 consist of 54 digital input and output pins (out of 14 pins are used as PWM outputs), 16 analog inputs, 4 UARTs (hardware serial ports), a 16 MHz crystal oscillator, a USB connection, a power jack, an ICSP header, and a reset button. It contains everything needed to support the any microcontroller, to get started arduino mega simply connect it to a computer by using a USB cable or power it with a AC to DC adapter or battery[2]. Arduino has many more advantage over other controllers [6][13].

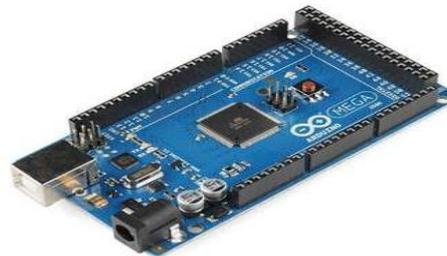


Fig.4. Arduino Board

IV. EXPERIMENTATION EXPECTED RESULT

For experimentation will consider a system designed for the charging of cell phone whenever the user want to access system, user has to scan the finger print first. System should verify the proper matching of fingerprint of the user. Ones it is authenticated the available locker must open automatically. For more convincing will provide LCD display which will provides the notification about different operation of the station such as welcome to charging station, waiting for valid finger, fingerprint match of user, door open, door lock, invalid finger, all rack are busy please visit after sometime etc. For blind peoples will also try to give audio instructions. LED will give the indication about available locker for the user. Whenever the unauthorized user try to use system “Your Finger is Not Register” message will display on LCD. LED will provide indication as soon as the cell phone charging is about to done. System also be movable from one place to another in case of installation place is change. During design of any electronic circuit on printed circuit board it is very essential to follow the design steps as explain in [11] for successful implementation of system. As a future scope in system discussed is use of IoT technology or wireless android notification for searching of charging station. IoT gives a good solution for different technological problems with making system more convenient [12].

V. CONCLUSION

In this paper we discussed different types of systems designed for the charging of electronic device. Mainly systems are designed using pin code security and RFID based system. All the systems are providing the securities to charging electronic devices but unfortunately having some drawback such as un useful for illiterate user and carrying respectively. The third system which we discussed in paper is system design using and biometric security. This system endeavours the charging of cell phones with providing high security to cell phones when charging of cell phone is in

process. The security to the hardware of system is provided by the biometric sensor. Multiple users can use the proposed station for charging their cell phones. User can access the system by scanning their fingerprint and then the fingerprints are converted into digital signal. When the fingerprints are match to the stored fingerprints then available locker is open. After completion of charging of the cell phones, user can plug out their cell phones by scanning their fingerprint again for retrieval operation. With this review study one we can conclude that if will design a system using biometric sensing technology then it will be one of the best systems for the said purpose.

ACKNOWLEDGMENT

We would like to express profound gratitude to **Dr. R. V. Kshirsagar** (Principal, SIEM Nashik) for his valuable support, encouragement, supervision and useful suggestions throughout this work. Also to **Dr. D. P. Patil, Prof. S. Y. Kanawde** and **Dr. Chittaranjan Nayak** of department of Electronics & Telecommunication for moral support and continuous guidance enabled us to complete this work successfully

REFERENCES

- [1] Grant sanders, Dallas, TX(US), *Recharging system for personal electronic device*, Michael A. O'Neil, Michael A. O'Neil, P.C, Suite 820, 5949 Sherry Lane, Dallas, TX 75225(US), Jan.28,2003
- [2] Swapnil R. Kurkute, Aishwarya Thenge, Shivani Hirve, Diksha Gosavi, *Cattle Health Monitoring System - A Review*, International Journal of Advanced Research in Computer and Communication Engineering, ISSN (Online) 2278-1021, Vol. 7, Issue 1, PP-139-140, DOI 10.17148/IJARCCE.2018.7122 January 2018
- [3] Jack standish Phelps, Brooklyn, NY(US), Adam H. Johnson, New York, NY(UUS) *Managing The Use Of Secure Compartments in charging Stations for Portable Electronic Devices* Nov.17, 2011.
- [4] S. R. Kurkute, Gopal Girase, Prashant Patil, *Automatic Energy Meter Reading System Using GSM Technology*, International Journal of Innovative Research In Electrical, Electronics, Instrumentation And Control Engineering, ISSN: 2321-2004 (Online) Volume No.-4, Issue No.-3, IF- 4.855
- [5] B. Institute Where are biometrics used 2015, [Last accessed on 07Jul 2015]. [Online]. Available: <http://www.biometricsinstitute.org/pages/faq-3.html>.
- [6] S. R. Kurkute, C. Medhe, A. Revgade, A. Kshirsagar, *Automatic Ration Distribution System A Review*, Intl. Conf on Computing for Sustainable Global Development, 2016
- [7] Stephen collins, Lakewood, CO(US), Suzzane Collins, Lakewood, CO(US) Charging Cabinet March 28 2007.
- [8] Swapnil R. Kurkute, Dipak Patil, Priyanka V. Ahire, Pratikha D. Nandanvar, *NFC Based Vehicular Involuntary Communication System*, International Journal of Advanced Research in Computer Science, ISSN No. 0976-5697 Volume 8, No. 5, May-June 2017
- [9] Yash Mittal, Aishwary V arshney, Prachi Aggarwal, Kapil Matani and V. K. Mittal, *Fingerprint biometric based access control and classroom attendance management system*, Mar.31, 2016.
- [10] James Mullin, Livermore, CA(US), John Zaniker, Severna Park, MD(US), James Conrad, San Lorenzo, CA(US), Daryle Bobb, Rockville, MD(US) *Multiple Kiosks For Rental Of Securable Devices* Sep.15,2013.
- [11] Swapnil R. Kurkute, Kakrале Priti Nivrutti, Kale Shraddha Sunil, Kudav Aboli Santosh, *PCB Quality Monitoring*, International Journal of Modern Embedded System (IJMES), ISSN: 2320-9003(Online), Volume No.-5, Issue No.-1, Page No-13-16, February, 2017
- [12] B.D. Deore, S. R. Kurkute, Pooja Bhalerao, Kajal Barve, Mokshada Deore, *IoT Based Smart Car Parking System Using Android Application*, International Journal of Advanced Research in Computer and Communication Engineering, Vol. 7, Issue 3, Month 2017, Pp-173-177
- [13] S. R. Kurkute, C. Medhe, A. Revgade, A. Kshirsagar, "Automatic Ration Distribution System -A Review". Intl. Conf. Proceedings of the 10th INDIACom; INDIACom2016; IEEE Conference ID: 37465 2016 on Computing for Sustainable Global Development, 2016