International Journal of Computational Research and Development (IJCRD)
Impact Factor: 4.775, ISSN (Online): 2456 - 3137
(www.dvpublication.com) Volume 1, Issue 2, 2016

FOSTERING INNOVATIONS IN PERVASIVE APPLICATIONS THROUGH TEACHING & LEARNING OF STEMSEL MICROCHIP TECHNOLOGY

K. Balaji*, Miroslav Kostecki & P. Senthil Kumar*****
* Assistant Professor / ECE, SSM Stemsel Electronics Innovation Centre, SSM College of Engineering, Tamilnadu
** Stemsel Inventors Club, Australia
*** Head / ECE, SSM Stemsel Electronics Innovation Centre, SSM College of Engineering, Tamilnadu

Cite This Article: K. Balaji, Miroslav Kostecki & P. Senthil Kumar, "Fostering Innovations in Pervasive Applications through Teaching & Learning of STEMSEL Microchip Technology", International Journal of Computational Research and Development, Volume 1, Issue 2, Page Number 41-43, 2016.

Abstract:

This Paper describes the new Paradigm in the Teaching & Learning of Embedded & Microcontroller programming and Application Development. The Authors use the STEMSEL Microchip Programming methodology to teach the Application Development for Pervasive Computing Environments. In the recent years the development of Applications in Ubiquitous environments with the use Internet of Things has triggered a massive research challenges and intensive programming needs. This paper explains the use of a new Integrated Development Environment using simple Graphical Drag & Drop based tool to program such applications. This is applied to develop applications using Bluetooth, WIFI etc for various pervasive computing needs. This Integrated Development Environment is very useful to teach & learn such technologies in a simple and quick way. In this paper, it is shown that the use of STEMSEL Microchip technology in Teaching, Learning, and Development of Pervasive Applications will reduce Learning Time & Time to Market the Applications.

Key Words: Pervasive Computing, Internet of Things, STEMSEL Microchip

1. Introduction:

Pervasive Computing Applications refer to the class of emerging applications that has Embedded Microprocessors with different communication technologies associated to transfer data and control between each other. It is also known as Ubiquitous computing to signify the concept "Existing Everywhere" [1] . In the recent years there has been a lot of developments in the area of application development which are Pervasive in nature. Other than Pervasive, Internet of Things (IoT) has been considered as a next generation technological advancement that is expected to fuel a large number of applications that can impact the Day-to-Day life. These applications ranging from Medical to Home Automation can change the way people use the gadgets over years. These two technologies are expected to change the Desktop kind of usage into a virtual Mobile way of using the things ranging from Kitchen appliances to advanced control systems.

2. Literature Survey:

A lot of Business Opportunities and Research challenges are anticipated in the field of pervasive Application design and Internet of Things (IoT). In [2] the authors presented a wide range of IoT based applications in the field of Agriculture. The sensors and the actuators for different purpose in the agricultural environment are integrated using different technologies in the IoT model. In [3] the IoT Application namely "Smart & Connected Health care" is discussed. In the Paper the authors use the Body area Networks as the sensing and Data Acquisition system, Bluetooth & Zigbee as the transmission technology, a Handheld Mobile device as the concentrator and the analytics of the collected data are stored in the Cloud.

3. IoT Applications:

3.1 Smart Home: Smart Home is the advanced version of Building Automation, in which the appliances are controlled and monitored by sensors and Mobile devices. According to [4] "The total amount of funding for Smart Home startups currently exceeds $2.5bn."

3.2 Wearable Devices: Wearable devices are smart Electronic devices that can be worn on the body and can be used for functions like activity trakers.

3.3 Smart City: A Smart city is a Urban Region that is highly advanced in terms of the services provided like Water Distribution, Waste Management, Security Management using the network among things and systems.

Apart from these major applications that uses the Embedded Pervasive Microprocessor chips and their inter communications as referred as IoT , there are many forms like Smart Retail, Smart Grid, Smart Farming etc.

4. IoT Opportunities:

In [4] the opportunities that are anticipated in the area of Iot and Pervasive computing applications are ranked based on the Search Engine and Social media searches and conversations. The survey analyses the searches in Google and two important social media websites like Linkedin & Twitter. The applications are ranked based on the hit in these three sites. It is found that Smart Home, Wearable Devices, Smart City, Smart Grid, Industrial Internet for Remote Asset Control received top ranks five in the survey. The Smart Home

received 61K searches in a Month in the Google. This shows the importance of Applications that are expected to come and the need of trained people to develop such applications.

5. IoT Challenges:

The new class of Applications in the IoT faces some of the challenges like security issues, Interconnection and Standards Issues. As the opportunities are large new startups and Technology companies emerge and start to build and release their own flagship products, there is also a high demand for the developers and designers in this field. It is also important for the designers and Learners to equip themselves in these latest technologies to gain the opportunity. Hence the Training firms and Universities have started to provide a Hands on Training in these new Networking and Pervasive technologies and architectures using a variety of Integrated Development Environments and Hardware Emulators. Inspite of the facilities and trainings provided, the Industry is lacking a skilled Manpower to meet the rising demand in IoT design. In [5], the Industry survey by Campatia IT Industry Trends and Analysis-2017, which reports the high growth of applications and projects in the IoT and Artificial Intelligence, has also stressed the widening skill gap and the difficuilty of the employers in finding the candidates with the right combination of technical and soft Skills.

6. Stemsel Microchip for IoT:

STEMSEL stands for Science, Technology, Engineering, Mathematics, Social, Enterprise, Learning which uses the Microchip Development Board for Teaching, Learning and Developing products for various Embedded and IoT applications. The STEMSEL Microchip Board helps to teach and create the products in a short span of time. The Board has a unique Software tool for programming the Board which uses only a simple Graphical Drag and Drop structures for various processing and controlling elements required for an Embedded Programming like Time Delay, ON/OFF, Decision Making, Looping etc. The paper focuses on a Bluetooth Based Application for Home Automation developed using STEMSEL Microchip Technology. The Primary advantage lies in the simplicity of the method used to make a project prototype and the time to Teach & Learn.

6. Stemsel Microchip Home Automation Prototype:

Figure 1. shows the Architecture of the Home automation project prototype developed with the help of STEMSEL Microchip Development Board. The Microchip Board acts as the main controller and recieves the control command from the user through a Bluetooth Transceiver module HC-05. The user can send the commands through his Mobile device. The user can send the control commands using the ANDROID APP installed in the Mobile Device.

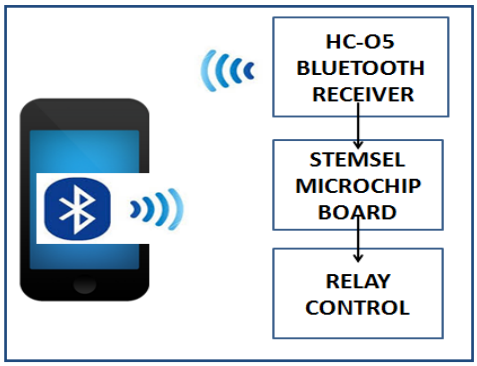

Figure 1: Architecture of Automation Project

The Figure.2 Shows the Prototype Board for the Development of Bluetooth Based Automation system using STEMSEL Microchip Board. The Prototype enables to control the appiances in real time.

7. Stemsel Microchip Design Features:

The Home Automation Project built using STEMSEL Microchip technology has the advantage of developing such application in a short span of time.

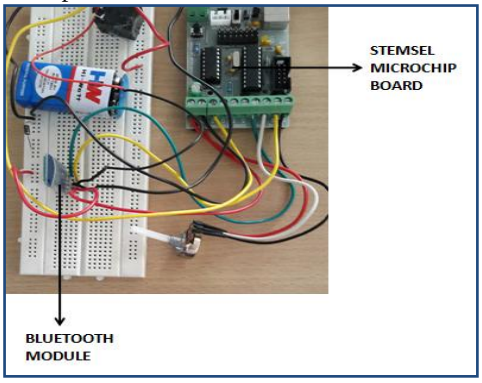

Figure 2: Bluetooth Automation Prototype Using STEMSEL Microchip Board

The Board provides a Interfacing virtual Environment which guide us to connect different peripherals and a core chart software to make the Program flow and send the Program to chip.

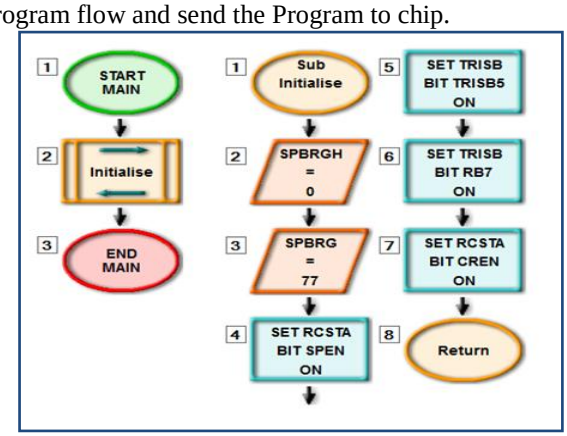

Figure 3: Corechart Sample to Initialise the Prototype

Figure.3 shows the method of programming the STEMSEL Microchip development Board using a Flowchart model without the need of aa assembly level or a High Level Programming Knowledge. This sample corechart helps to initialise the Baud rates of the Bluetooth and assigns the TX and RX Port pins.

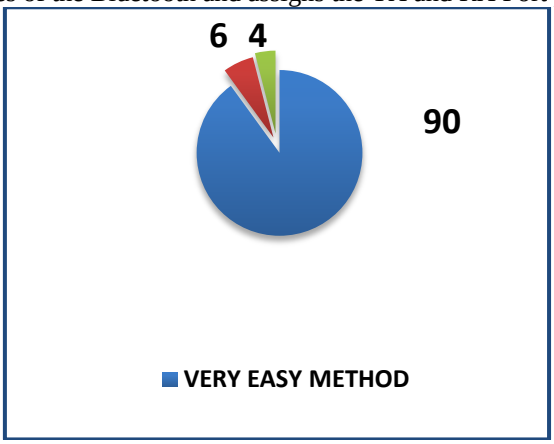

Figure 4: Survey Outcome of the STEMSEL Microchip Programming Methodology

The Authors in the STEMSEL Innovation Centre, after teaching the Bluetooth protocol programming and Hardware Interfacing, conducted a survey among the learners. The Learners are from different age groups. The survey questions included different aspects like easiness in Programming, Time to Develop, Time to Debug, Time to Learn etc. Figure.4 shows the outcome of a survey related to the easiness in the programming Methodology. The Outcome clearly shows that 90 percent of the Learners found it very Easy to use and develop an application.

8. Conclusion:

Thus the paper describes the new teaching & Learning methodology in the area of Embedded Microchip application development for IoT and Pervasive Communication intensive infrastructures. The Prototype developed in the paper focus a sample application based on Bluetooth wireless technology. The method is equally applicable to develop advanced projects using WiFi, RFID, ZigBee etc. The method thus helps to reduce the widening gaps that are a big hurdle in the pace of IoT product development. The Survey Outcome proves the simplicity of the method that helps the Training Firms and Institutions to Foster more Innovations in the near furture. This definitely helps more smart applications in the fields of Agriculture, Medical, Lifestyle & Industrial Environments.

9. References:

1. url:https:\\www.techopedia.com, Pervasive Computing
2. IoT based Smart Agriculture" , Nikesh Gondchawar1, Prof. Dr. R. S. Kawitkar, International Journal of Advanced Research in Computer and Communication Engineering Vol. 5, Issue 6, June 2016
3. Health Monitoring and Management Using Internet-of-Things (IoT) Sensing with Cloud-based Processing: Opportunities and Challenges, Moeen Hassanalieragh et al, 2015 IEEE International Conference on Services Computing
4. url:https://iot-analytics.com/10-internet-of-things-applications/
5. https://www.comptia.org/resources/it-industry-trends-analysis-2017