



ISSN: 0975-766X
CODEN: IJPTFI
Research Article

Available Online through
www.ijptonline.com

A NEW APPROACH TOWARDS DESIGN AND DEVELOPMENT OF SMART PILLS VENDING MACHINE

M.Narayana Moorthi¹, R.Manjula²

¹Assistant Professor (SG), SCOPE-VIT University, Tamilnadu, Vellore-14.

²Associate Professor, SCOPE-VIT University, Tamilnadu, Vellore-14.

Received on: 18.10.2016

Accepted on: 11.11.2016

Abstract

The vending machine is an example of a real time system. There are many vending machines available for public like coffee vending machine, ice cream vending machine, chocolates vending machine and coin vending machine. The use of vending machine for health domain needs a comprehensive study. The pharmacy department of any hospital or clinic needs the transactions to be quick and simplified. In this paper we investigate how to design a vending machine for tablets and medicines. The pills remainder with smart alarm system can be recommended for adult persons who forget to take medicines in time. The enough number of vending machines can be kept in the hospitals or road highways, airports for quick and easy access to tablet and medicine transactions. One of the challenging tasks of ongoing project of smart city is to minimize the number of accidents in the road traffic and install the first aid boxes in regular intervals of highways for easy access of medicines. This can be done by the design of smart vending machines with low budget which can be installed on the roadsides for easy access to everyone. The purpose of this vending machine is to sell the tablets or pills automatically to the patients or needy persons. The payment of this can be by insertion of coins or rupee notes to the machine. This machine has a user friendly interface which displays the menu of basic emergency available tablets or medicines like headache, cold, fever, cottons and bandage, etc. Here we study the design and development process and simulate a program for automatic pill vending machine.

Keywords: Automation of pharmacy transactions, vending machine, embedded system

Introduction

The vending machine is a real time [1] [2] [3] [4] system which can be used for vending the pharmacy items like tablets or pills using menu driven user interface. The control system has a main microcontroller which controls the operation of various interfacing devices like keypad, coin insertion device, credit card device, LED, LCD and wireless internet communication [5] [6] to remote locations. The machine has a mechanical storage where the items

like tablets can be stored and retrieved for selling purpose. The machine displays the items available in the output [7] [8] [9] [10] [11] [12] unit. The user or customer can select the item and quantity and the machine displays the total amount to be paid along with payment modes like cash or credit card. The user pays the required amount and the machine dispenses the required number of tablets and returns the balance amount if any. The machine can send an SMS to the remote administrator for every transaction so that the inventory can be refilled based on demand. These vending machines will be more useful for hospitals and clinics where the needed persons can get the medicine very quickly and the transaction is automatic. The government can install as many machines as possible to the road traffic and public places for easy access to everyone where the immediate need of medicines for the travel persons or needy persons can be obtained easily. The inventory of the machines can be updated with the use of advanced technologies.

Proposed System Architecture.

The following figure 01, 02 and 03 illustrates the system architecture of proposed pills vending machine for automation of pharmacy transaction.

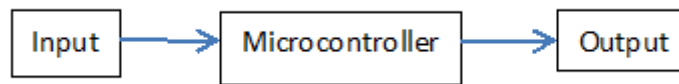


Figure 01: Simple vending machine.

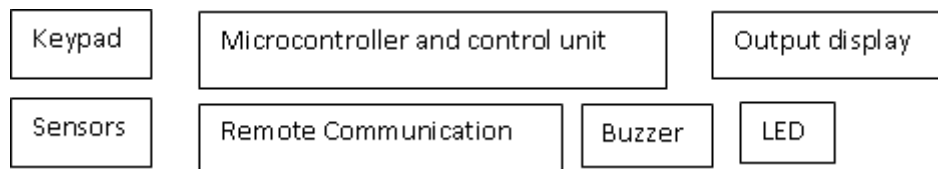


Figure 02 – Block diagram of Pills vending machine.

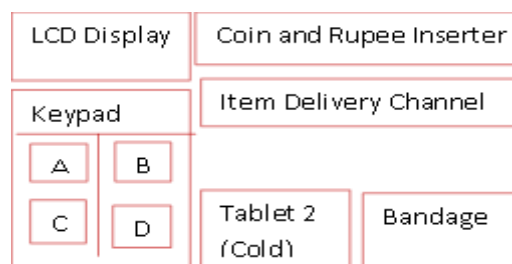


Figure 03- Layout of pills vending machine.



Figure 04 – Layout of existing pills vending machine.

Design process and specifications of pills vending machine is as follows

Name of the device	:	Pills vending machine
Purpose	:	To sell the pills or tablets to customers automatically
Input(s)	:	Coin or Rupee notes and user commands
Output(s)	:	Tablets or pills and GUI for message display
Function of the system	:	The working of pills vending machine is as follows,

- (1) The machine displays the welcome message on LCD after reset and displays the GUI user interface menu for list of items for tablets or medicines
- (2) The customer or patient selects the items and the quantity through keypad interface
- (3) The machine displays the amount to be paid for the items
- (4) The persons or users inserts the coin or rupee through coin or rupee insertion box
- (5) The machine verifies the inserted amount and dispenses the required number of items by activating the motor an necessary interface logic circuits
- (6) The customer obtains the required pills from the delivery slots
- (7) The machine communicates to remote location for transaction updates

The system includes a set of sensors configured to detect a variety of service conditions, including device is low or out of stock, as well as out of order conditions. The sensors generate output signals that are input to a transmitter disposed at the vending machine. The interaction between user and computer machine or vending machine is more demanding for day to day activities. These interactive devices are generally known as mobile devices or embedded smart phones or systems. The example embedded device is a cell phone. The phone is useful for various services like voice communication and messaging services, taking pictures and playing videos or games, etc. These services will be utilized towards development of mobile health care activities. Modern cell phones are available with a variety of sensors that automate many of our routine tasks. The use of smart cell phone with wireless communication technology combined with IOT-Internet of things is changing the world and it will be more useful to the health care of patients in hospitals. The continuous improvement in mobile device with integrated multiple sensors adds more value for health domain for mobile health care applications like patient care and remote monitoring. Now a day everyone has the smart cell phones with multiple sensors integrated on it. These Sensor enabled mobile phones can

collect the continuous sensor data from the persons or patients and it will be more useful for doctors to provide immediate treatment.

List of Hardware and software requirements are as follows

Hardware Requirements: Microcontroller, keypad, sensor, dc motors, LED, LCD, Buzzer, wireless communication device, interface accessories, Software Requirements: Program development IDE, simulator or emulator, the various software task modules like time display, date display, and welcome display, menu interface module, keypad module, payment calculation module, amount display module, coin or rupee verification module, delivery of items task, update of information to remote modules.

The microcontroller is the central part of the proposed system. It is a system on chip which has built in input and output ports and RAM and ROM. It has many internal peripherals like timer, interrupt controller, serial port for communication. The microcontroller is interfaced with the necessary I/O devices for proper vending machine operation. The software can be developed using either Assembly Language or High level languages like C, C++ or Java.

The Input Output (IO) ports: The system gets the inputs and outputs from these. Through these, the keypad or LCD units attach to the system. The serial port communication can be established through UART. UART: Universal Asynchronous Receiver and Transmitter.

LED: Light Emitting diode, a diode that emits red, green, yellow or infrared light on forward

Biasing between 1.6V to 2 V and currents between 8 - 15mA.

LCD: Liquid Crystal displays. Multi-segment and multi-line LCD units are used for a display of digits, characters, charts and short messages with very low power dissipation.

The system gets inputs from physical devices such as, the key-buttons, sensors through the input ports. The system has output ports through which it sends output bytes to the output devices such as LED (Light Emitting diode) or LCD (Liquid Crystal Display) panel. A system requires an interfacing circuit and software to display the status or message for a line, for multi-line displays, or flashing displays. For indicating ON status of the system there may be an LED, which glows when it is ON. A flashing LED may indicate that a specific task is under completion or is running. It may indicate a wait status for a message. An embedded system processor and the system need software that is specific to a given application of that system. The processor of the system processes the instruction codes and

data. In the final stage, these are placed in the memory (ROM) for all the tasks that have to be executed. The final stage software is also called ROM image

The following Software Tools are used for developing the embedded Application

Editor: For writing C codes or assembly mnemonics using the keyboard of the PC for entering the program.

Interpreter: For expression-by-expression (line-by-line) translation to the machine executable codes.

Compiler: Uses the complete sets of the codes. It may also include the codes, functions and

Expressions from the library routines. It creates a file called object file.

Assembler: For translating the assembly mnemonics into binary opcodes. It also creates a list file that can be printed.

The list file has address, source code (assembly language mnemonic) and hexadecimal object codes.

Cross Assembler: For converting object codes or executable codes for a processor to other codes for another processor

and vice versa. The cross-assembler assembles the assembly codes of target processor as the assembly codes of the

processor of the PC used in the system

Development. Later, it provides the object codes for the target processor. These codes will

Are the ones actually needed in the finally developed system?

Simulator: To simulate all functions of an embedded system circuit including additional memory and peripherals. It is

independent of a particular target system. It also simulates the processes that will execute when the codes execute on

the targeted particular processor.

IDE: Integrated Software and hardware environment that consists of simulators with editors, compilers, Development

assemblers, RTOS, debuggers, stethoscope, tracer, emulators, logic analysers, EPROM Environment EEPROM

application codes' burners for the integrated development of a system.

Prototype: For simulating, source code engineering including compiling and debugging

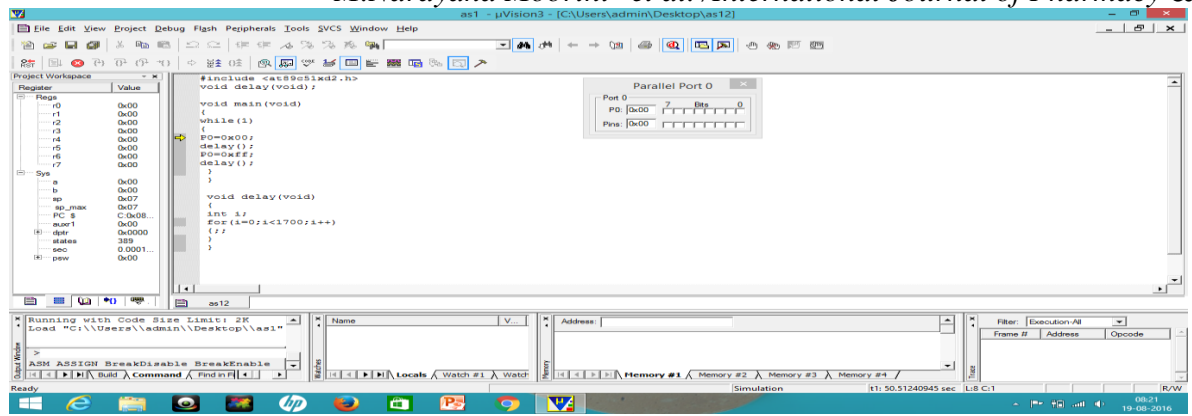
Device Programmer: It takes the inputs from a file generated by the locator and burns the link to actually store the

data and codes at the ROM.

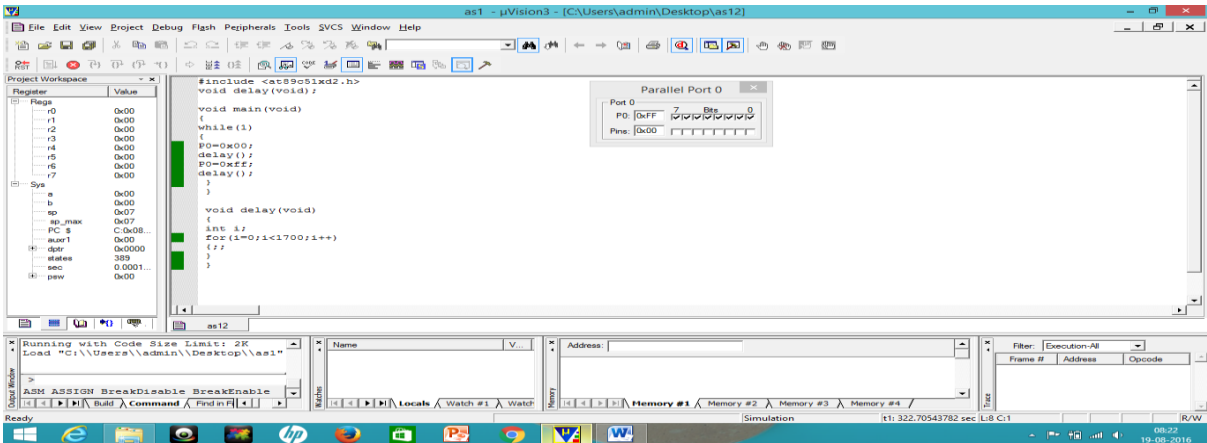
Simulation of test results

The following snap shots figure 05, 06, 07, 08, 09 and 10 illustrates the simulation results of automatic pills dispenser

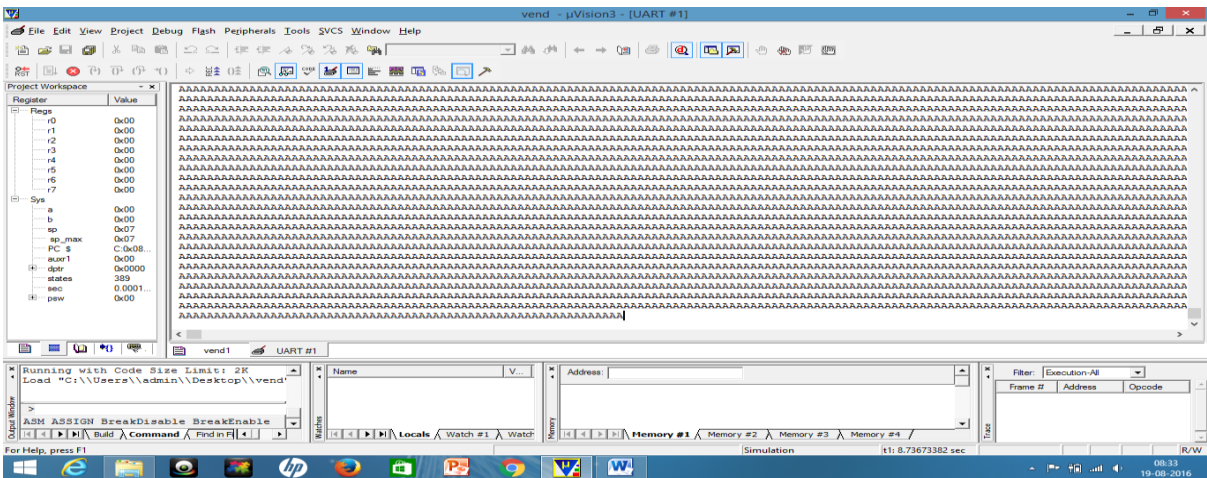
using 8051 microcontroller. The Keil micro vision software is used for simulation of the same.



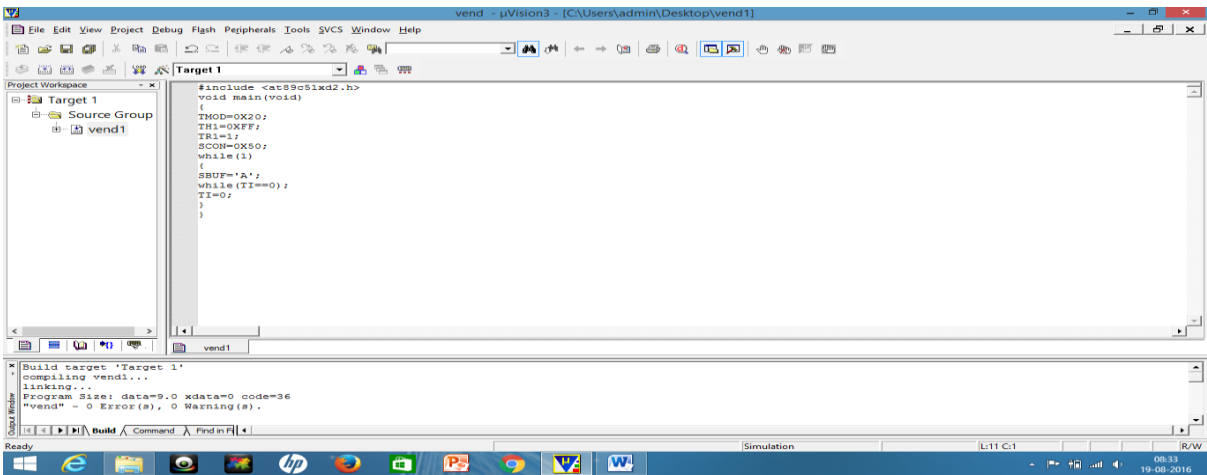
Snapshot 01

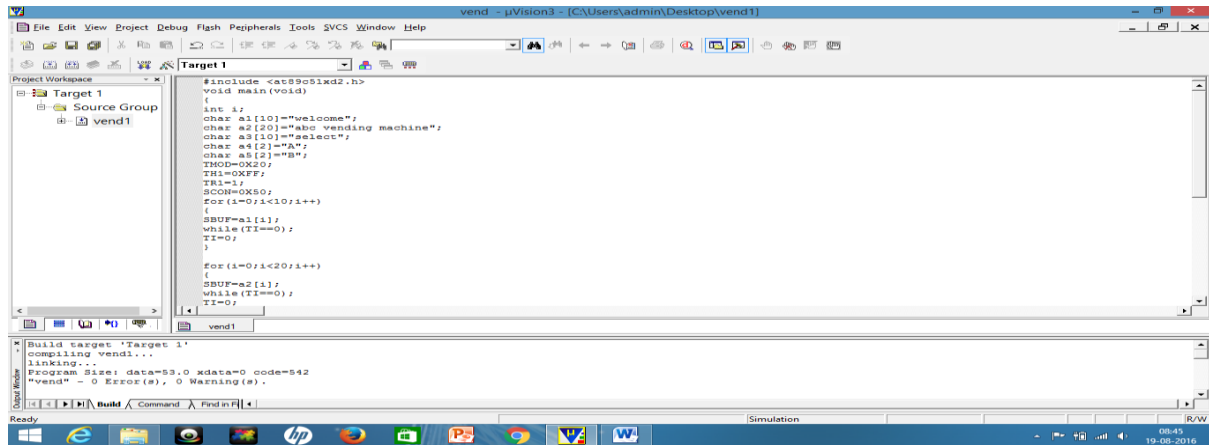


Snapshot 02

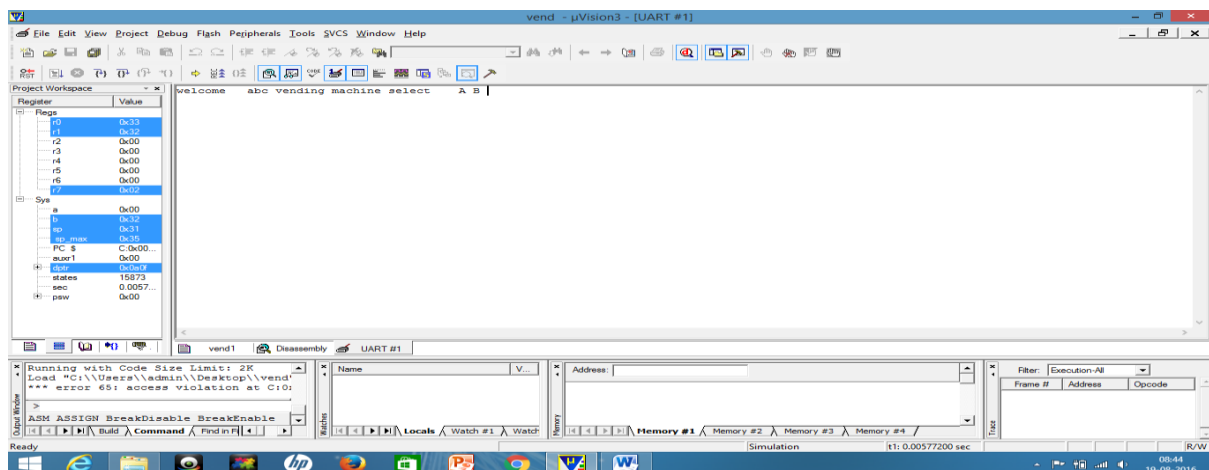


Snapshot 03





Snapshot 05



Snapshot 06

Summary and conclusion

Thus the design of vending machine for automatic pills dispenser is studied and simulated using the Keil micro vision simulator. It is a real time system which can be used for vending the pharmacy items like tablets or pills using menu driven user interface with low cost instruments.

References:

1. Wayner Wolf, Computers as components – Principles of embedded computing system design, Morgan Kaufman Publishers, 2nd edition, 2008.
2. Rajkamal, Embedded Systems-Application, Practice & Design, Tata McGraw Hill, 2003.
3. Arnold S. Berger, Embedded Systems Design, CMP Books, 2001.
4. World Health Organizations: Global Observatory for eHealth series - Volume 3 MHealth New horizons for health through mobile technologies.
5. Evgeny Stankevich, Ilya Paramonov, Ivan Timofeev P. G. Demidov Yaroslavl State University, Yaroslavl, Russia, Mobile Phone Sensors in Health Applications Proceeding of the 12th conference of fruit association.

6. MasoudNosrati* RonakKarimiHojat Allah Hasanvand Mobile Computing:Principles, Devices and Operating Systems World Applied Programming, Vol (2), Issue (7), July 2012. 399-408 ISSN: 2222-2510©2012 WAP journal.
7. VilemSrovnal, Marek Penhaker, JindrichCernohorsky, Ondrej Frantisek EMBEDDED SYSTEM DESIGN FOR HEALTH SUPERVISORY SYSTEMS Ubiquitous Computing and Communication Journal.
8. Özkil, Ali Gürcan; Fan, Zhun; Dawids, Steen; KlæstrupKristensen, Jens; Christensen, Kim Hardam; Aanæs, Henrik Service Robots for Hospitals: A Case Study of Transportation Tasks in a Hospital Published in: Proceesings of 2009 IEEE International Conference on Automation and Logistics.
9. DeeptaRajan, Andreas Spanias, SuhasRanganath, Mahesh K. Banavar, PhotiniSpanias *SenSIPCenter, School of ECEE, Arizona State University. Health Monitoring Laboratories by Interfacing Physiological Sensors to Mobile Android Devices.
10. M.Narayana Moorthi.*, Dr.J.Vaideeswaran, Design of an Embedded System for Health Monitoring and Emergency services using wearable sensors, International Journal of Advances in Engineering Sciences Vol.3, Issue 1, January, 2013 Print-ISSN: 2231-2013 e-ISSN: 2231-0347 © RG Education Society (INDIA).
11. M.Narayana Moorthi, R.Manjula, developing a framework for automated patient care monitoring system for medical clinics using 8051 microcontroller, IJPBS.
12. Mazidi and Mazidi, 8051 Microcontroller programming in assembly and C.