

Home Automation with MATLAB and ARDUINO Interface

^[1] Singam Sridhar, ^[2] S Preethi, ^[3] CH Sampath, ^[4] MD Azmath Ali
^[1] Asst. Professor

Balaji Institute of Technology and Science, Warangal, Telangana.

Abstract: -- Home automation trade has drawn the goodish attention of researchers for quite a decade. The main plan is to mechanically management and monitor electrical and electronic home appliances. Consistent with the marketing research firm ABI regarding 4 million home automation systems were subscribed globally in 2013. An equivalent firm additionally calculable that regarding 90 million homes would use home automation system by the top of 2017, many industrial and analysis versions of the home automation system are introduced and designed. A good home system has captured many technologies. Main aim of this paper is to propose a system which demonstrates interfacing between MATLAB and Arduino board for household equipment monitoring and control. In the proposed system, Arduino board is interfaced with MATLAB using serial communication to control home appliances. Image acquisition device is interfaced to MATLAB that will continuously show the status of household equipment's on Graphical User Interface [GUI] designed in MATLAB. Proper commanding is done from MATLAB GUI, household equipment's can be turned ON or OFF which are interfaced to Arduino through relay board.

Keywords- Arduino UNO, MATLAB, Automation, Condition monitoring, Computerized Monitoring.

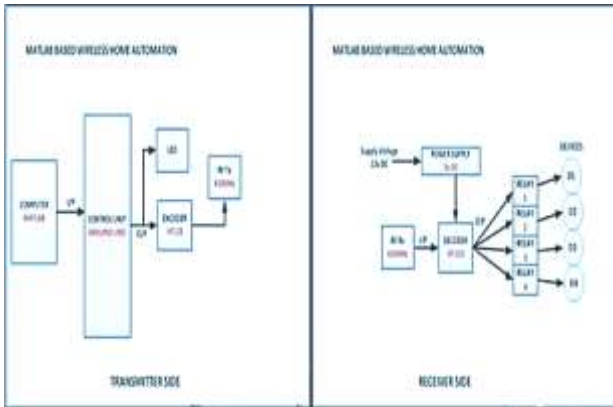
I. INTRODUCTION

The Home automation market is very promising field that is growing at faster rate. Lot of discussion has been carried out about home automation systems. It shows that, home automation is a technology involving centralized & autonomous control of housing, buildings and industry, including safety features against various sudden unanticipated scenarios. Home automation basically incorporates an electronic control of household activities like control of electrical appliances, lightning, central heating & air conditioning and security system. The rapid growth and application of control systems has not been confined to industrial use but also implemented in personal and private spaces of people all around the world. The idea of autonomous home has been one of the most desirable technologies in life of human beings and considerable improvements have been made in this field. The system presented in this paper shows continuous monitoring and control of home appliances with Arduino Matlab interface. Realizing the hardware potential, software suppliers Like Mathworks and National Instruments have included the Arduino package on the software accessories of MATLAB and LAB View.

II. LITERATURE SURVEY

In 21st century, various system implementations are present for home automation with wired as well as wireless communication as key element. A comparative analysis on most common and recent techniques that have been implemented in field of home automation systems along with

advantages and disadvantages of each . A novel architecture for a home automation system is presented and implemented in using Zigbee technology which lowers the expense of system and the instructiveness of respective systems. Generally advanced aged people have more needs than middle aged people. Thus efforts are made to improve home automation system by using Z-wave technology to transfer data in home network to have control over devices . A system architecture presented in provides control over networked devices which can be controlled securely via internet. An intelligent automation system using Google cloud messaging server and android operating system uses a local device to transfer a signal to home appliances, a webserver to store customer and mobile smart device running android application as the emerging technology in home automation. As Speech processing with MATLAB and android application plays very vital role to support home automation system, a system presented in uses speech processing and speech recognition to control electrical appliances. System architecture developed in consists of ATmega16 as brain of system along with different supporting hardware's like remote controller, touch screen, temperature and humidity sensor, speed regulator. As per commands forwarded by user through touch screen all home appliances can be controlled manually .the system also works with complete automotive mode by detecting presence of human beings according to given commands. Now a day's many systems are implemented which uses simple image processing algorithm designed in MATLAB and hardware control support through MATLAB-Arduino



III. SYSTEM IMPLEMENTATION

System presented in this paper mainly contains Arduino board as brain of system which gives signalling to relay board to turn ON/OFF required device which is 230v 60W bulb, and 12 V dc motor. Necessary commanding signals are given through MATLAB to Arduino board via serial communication. Status of prototypes architecture is monitored continuously using Web cam which uses image acquisition toolbox of MATLAB. System diagram of presented system is as shown in figure 1.

Software Implementation:

For System proposed in this paper, Arduino board is configured as server to have proper interfacing with MATLAB. Required program implementation is done in MATLAB with Graphical User Interface which gives feasibility to User. The detailed work flow for software implementation

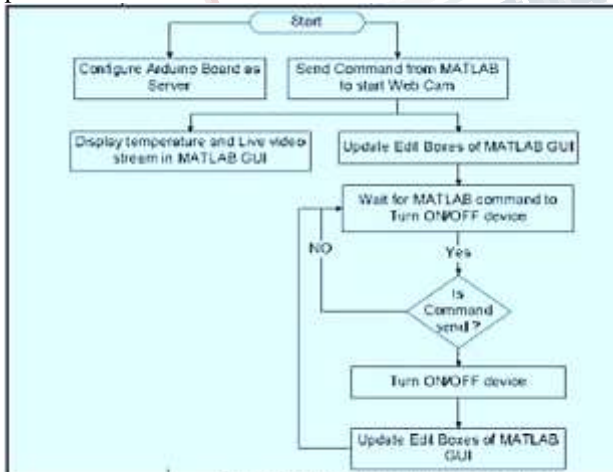
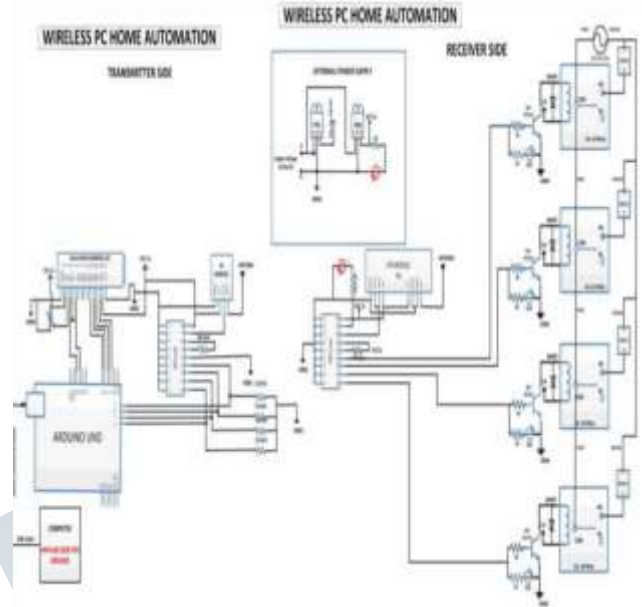


Figure 2: Work flow of proposed system

3.2 Hardware Implementation:



Pin connection

3.2.1 Arduino Board:



Figure 3: Arduino Uno Board

Figure 4: Relay Board

The Uno is a microcontroller board as shown in figure 3 based on the ATmega328P. It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz quartz crystal, a USB connection, a power jack, an ICSP header and a reset button. It contains everything needed to support the microcontroller; simply connect it to a computer with a USB cable or power it with a AC-to-DC adapter or battery to get started.

3.2.3 Relay Board : A 5V 4-Channel Relay interface board used in proposed system, This board is able to control various appliances, and other equipments with large current. It can be controlled directly by various Microcontroller like Arduino,8051.

3.2.4 16X2 LCD -

The LCD will be used to show the status of the devices controlled by the home automation system. It is connected to the Arduino board by connecting its data pins to pins 2 to 5 of the Arduino board. The RS and E pins of the LCD are connected to pins 13 and 12 of the Arduino UNO respectively. The RW pin of the LCD is grounded. The standard open-source library

LCD	Arduino UNO
RS	13
RW	GRND
E	12
D7, D6, D5, D4	2, 3, 4, 5 respectively

for interfacing LCD with Arduino UNO is used in the project. The library works as expected and needs no changes or modifications.

Power Supply - Both the circuits will be powered by 5V DC supply. The 7805 voltage regulator is used to supply the desired voltage. The power can be drawn from a regular battery which can be connected to the 7805 IC. The IC has three pins - pin 1 should be connected to anode of the battery, pin 2 and 3 with the cathode (common ground). The 5V DC should be drawn from the pin 3 of the IC.

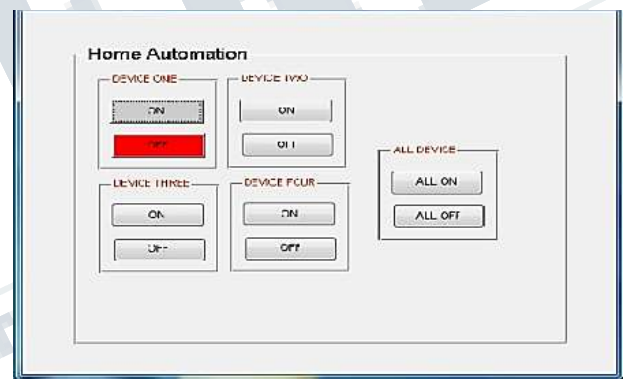
MATLAB APPLICATION

The home automation system developed in this project is operated by the Matlab Application. The user needs to plug the Arduino based transmitter circuit to the serial port of the PC and launch the Matlab based desktop application. It is important to note down the COM port number beforehand. The Matlab automatically generates the Arduino code by its ArduinoIO extension which should be burnt to the Arduino board. The generated Arduino sketch automatically reads the control data from the desktop application and drive digital Input and Output pins of the Arduino to display status of devices on LCD and send control data to switch appliances ON or OFF. The Arduino sketch actually allows Arduino to operate according to the Matlab application and allows the board to interact with the Matlab platform. On the receiver side, the RF receiver simply detects the control data over RF and passes it as parallel data on the data pins of the HT12D decoder IC. When a data bit is set to HIGH logic, the relay connected at that decoder IC pin switches from NC to NO point and the respective appliances starts getting the supply. When a data bit is set to LOW logic, the relay connected at that decoder IC pin switches back to NC point and the respective appliances stops getting the supply.

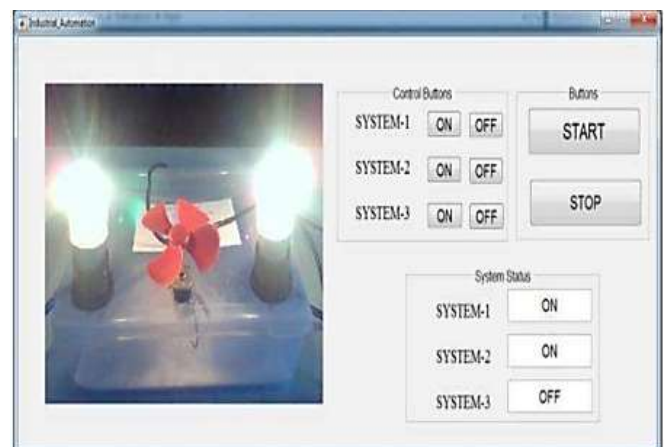
Table 1: Description of GUI elements

Sr No	Element	Name	Description
1	Axis- 1	Video Preview	Shows live monitoring of system
2	Axis- 2	Temperature Graph	Shows graph of sensed temperature
3	Pushbuttons -1	START	To start system
4	Pushbuttons -2	STOP	Stops system
5	Pushbuttons 3,5,7	ON	To Turn ON required device
	Pushbuttons 4,6,78	OFF	To Turn OFF required device
6	Edit Box-1	-	Displays Temperature
7	Edit Box 2,3,4	-	Displays status of device [ON/OFF]

IV. RESULT



system controlling switches model



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V. CONCLUSION

In this paper, we presented a system which is developed with MATLAB-Arduino interface to control simple home appliances. Webcam is interface and access through MATLAB to have continuous monitoring of whole system setup. The GUI designed in MATLAB allow user to turn ON and OFF interfaced devices and shows current status of these devices in edit box. Thus system presented in this paper is useful to understand basic hardware interfacing and controlling with MATLAB-Arduino interface.

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