Gesture Controlled Home Automation

Sumanta Dey, Amit Das, Anupam Mishra, Debayan Dutta

ABSTRACT

With each passing day the gap between machines and humans is being reduced with the introduction of new technologies to ease the standard of living. A gesture is a form of non-verbal communication where physical action, especially hands, is used for data transmission. Based upon the type of gestures, they have been captured via Acoustic (sound), Tactile (touch), Optical (light), Bionic and Motion Technologies through still camera, data glove, Bluetooth, infrared beams etc. Android platform has revolutionized the application development field for cell phone, opening new doors for technical exploration.
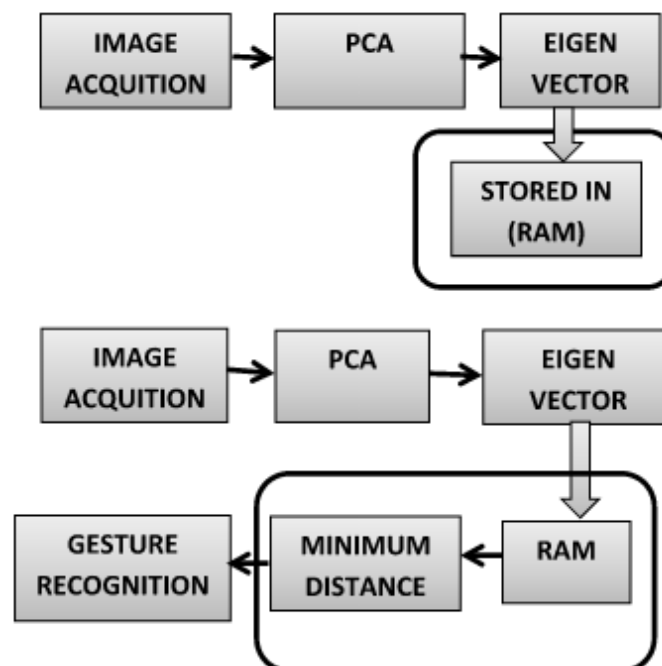
INTRODUCTION

In this project we have implemented the gesture control through computer vision with the mobile based home automation system using microcontroller. Keeping in mind the day to day challenges of life, with growing tasks in normal routine as well as time management, the following project has been implemented. We have used an android based smart phone with high resolution camera and Bluetooth. Here the camera of the cell phone would capture the hand images and send it via Bluetooth the microcontroller chip. This microcontroller would receive the digital signal and the corresponding switch is enabled via decoder. This decoder is responsible for the on and off of the home appliances.

OVERVIEW

The whole project is divided in two parts:
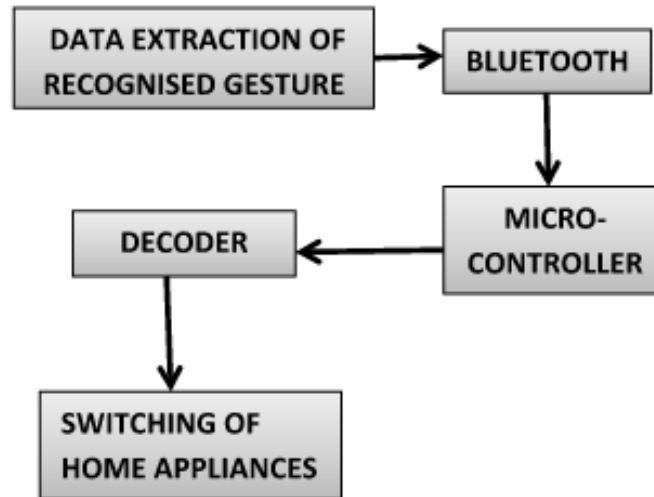
1. gesture recognition
2. home automation

Gesture Recognition

Address for correspondence:
amitdas943@yahoo.com

Home Automation

Steps of Implementation

- For different hand gesture the corresponding signal or code is stored in the RAM of cell phone.

- During its implementation the captured image of hand is graphically analysed by PCA and matched with the stored data.

- If it is authentic then the corresponding binary signal is transferred via Bluetooth to the microcontroller chip.

- On receiving the signal the microcontroller generates a binary combination to be fed to the decoder.

- The decoder decodes the signal and switches the required home appliance.

- Depending on the number of individual appliances and economical aspects the type of decoder is used in the circuit.
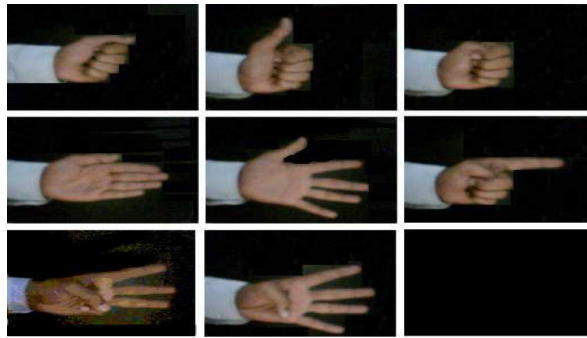
METHODOLOGY

Hand Gesture Recognition

- The camera in the cell phone should be set at high contrast and black & white theme, so as to get a binary combination of the colour with minimal noise in the picture quality.

- To eliminate the wrist noise a white band i.e. a good reflector is used and for contrast black background is used as shown below
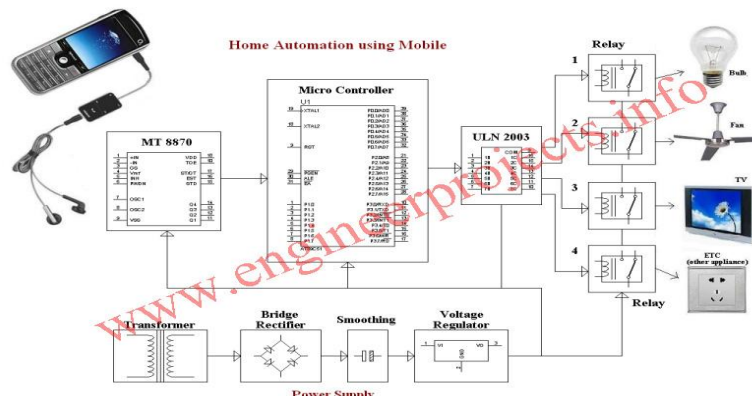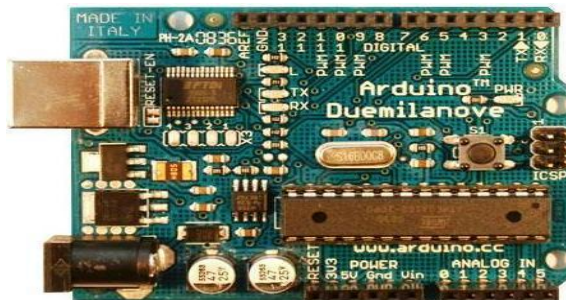
- The camera should be well equipped with flash during capturing.

- The captured image is then analysed for approx. resemblance with the stored image in the RAM with the help of Android software as shown below.

- If the stored image exists, the corresponding data is sent to the microcontroller chip via Bluetooth.

Home Automation

- In the home automation segment, we have a microcontroller based circuit.

- The circuit consists of a Bluetooth data receiver or RF receiver, decoder, comparator circuit, analyser, microcontroller chip, 8085 microprocessor chip.

- The data receiver receives the digital signal from cell phone.

- The signal is amplified and transferred to the analyser and comparator circuit.

- The amplified signal is passed through the microcontroller chip and forwarded to the decoder.

- the decoder decodes the analog signal and generates digital signal.

- The decoder is hence responsible for switching on and off of the appliances.

The above picture depicts a generalised circuit of a mobile based remotely controlled home automation, which mainly includes the vital components like microcontroller that encodes and decodes the signal sent through the mobile and relay that enhances switching ON and OFF of the electrical appliances.

CONCLUSIONS AND FUTURE WORK

The process of mobile based home automation is becoming the most important factor to introduce an automated environment in all homes. There are already E-home standards settling up in Europe, the example is the European Installation Bus (EIB) that is the world's

leading system for "intelligent" electrical installation networking. Not to forget that UPnP providing total compatibility with XML and IP. The biggest issue will be probably to make it usable and accessible to all kinds of users.

The vital merit of this project is that it comes under an affordable budget. The cost includes the price of a smart phone that is easily available in the present day scenario, a microcontroller chip that enables encoding and decoding which is a very low cost equipment and some relay kits. It is also eco-friendly as well as saves energy and human effort to a great extent

The initial installation cost may be a bit higher that includes labour of the technician, but it has a very low maintenance cost i.e. almost negligible.

There are some demerits too of the project like, the remotely controlled application has a limited accessibility i.e. a person can operate the home appliances within 100m of range or the range provided by the Bluetooth source, the main switch should be in the ON state for its operation always, it is unable to operate any high voltage appliances such as AC, microwave oven, room heater etc.

Since this is a new field of investigation, the results of the project are likely to be worthy of further analysis. The completion of a whole cycle of control between a remote device and the building will be critical for the success of the research. This research would positively contribute to the E-Home community.

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