

# ECA Based Device Automation Using Internet of Things

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## ABSTRACT

The automation industry has experienced rapid growth over the last decade. The aim of the proposed work is to automate appliances in Home/Industry using Internet of things (IoT). The system focuses on human-friendly technical solutions for easy control of appliances. Embodied conversational agent (ECA) based Android application is used to receive speech input from the user. Simple object access protocol (SOAP) is used to transfer the information from client to server. The remote server processes the commands received and translates them into actions of switching particular appliances ON or OFF. A novel embedded system has been designed, implemented and a small-scale prototype is developed and tested.

**Keywords:** Internet of things (IoT), Embodied conversational agent (ECA), SOAP, ARM7 controller, Embedded system.

## I. INTRODUCTION

With the advancement of Science and technology people's standard of living has improved and people are moving towards automated and intelligent home control systems. At present, blue tooth is used to control devices in remote location which has limited monitoring range, energy consuming, suitable for indoor localization and so on. Therefore, a device control system is built with user friendly Android application.

The proposed system is aimed at designing a device which can control the home appliances through smart phones using Android application. An ECA based android application is developed which enables us to control device through passing voice as input signal and it is transmitted to a remote server. Micro controller is connected to the server which in turn is connected to a relay to which the devices are directly connected. User can switch on/off the appliance through the application and the message is transmitted to the server, server on receiving the command checks the existing database and generates corresponding interrupt signal. The interrupt is received by the micro controller and it controls the relay which indirectly controls the devices.

In existing system, the devices will be controlled either by manual operation or Bluetooth which has limited

range of control over the device. The relay acts as a switch and one end of relay is connected to the AC supply and another is connected to the appliance. Thus based on the command sent the appliance is switched on/off. We have used ARM 7(LPC 2148) micro controller. The proposed system is independent of monitoring range after logging into the control interface, users can control any home appliance connected to relay such as lights, TVs and air conditioners from remote location from anywhere and at any time thereby improving the quality of life.

## II. METHODS AND MATERIAL

The system has been designed for measurement of electrical parameters of appliances. Important functions to the system are the easy to model, setup, and use. Managing electrical power consumption of various appliances along with supply voltage and current is the key parameter.

Proposed System enables the consumer for flexibility in controlling the devices: The users can switch the device on/off in three different ways.

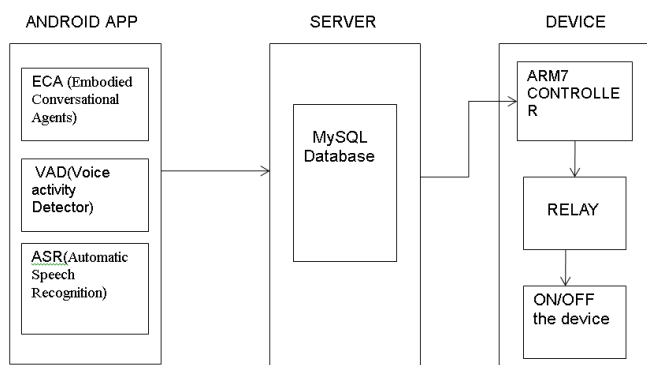
- **Mechanical control:** Based on the electricity tariff conditions, the appliance can be controlled with the help of smart software. This enables the user to

easily auto switch off the appliances during the electricity peak hours.

- **Physical control:** An on/off switch is provided to directly intercede with the device. This feature helps the user to have more flexibility by having manual control on the appliance without following automatic control. Also, with the help of the application developed for monitoring and controlling user interface, user can control the device for anytime use. This feature has the higher priority to bypass the automatic control.
- **Isolated control:** The smart power monitoring and controlling application system has the feature of interacting with the appliances remotely through internet. This enables user to have flexible control mechanism remotely through a secured internet web connection. This sometimes is a immense help to the user who has the habit of forgetting the status of appliances while away from house. The user can monitor the condition of all appliances and do accordingly.

- **Automatic Speech Recognition (ASR):** The Automatic Speech Recognition module performs speech to text conversion. It takes the input with the user’s speech that come from VAD module and sends the resultant text to the CE. In the proposed system, the ASR module is based on the Pocket Sphinx speech recognition library.
- **Server Communication:** The raw audio is filtered and gets matched with the audio base library. The implementation of android voice to text conversion which is connected to the server by entering the IP address. Received input text is compared with database and corresponding interrupt is generated. It is sent to the controller. Server communication is done by using web services based SOAP protocol.
- **Control interface:** This Interface translates the commands said by then user to a format that can be understood by the target applications or services running on the same device or accessible remotely. This module is domain specific and has to be re-designed or adapted for every new target application.

The architecture diagram as follows:

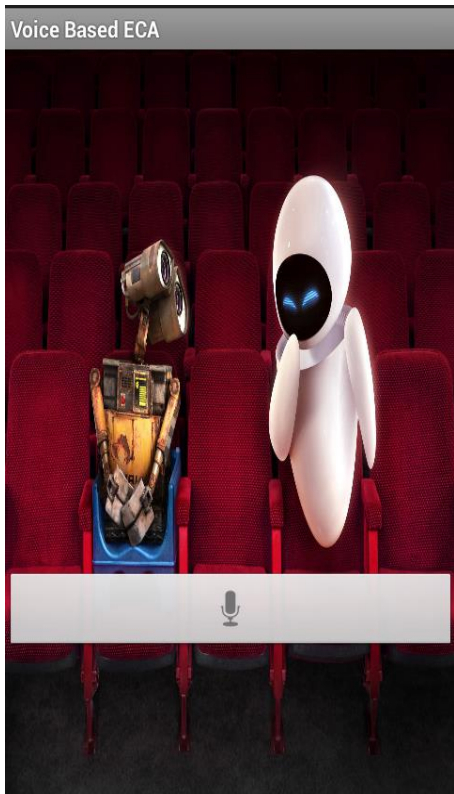


The interrupt given to the device :

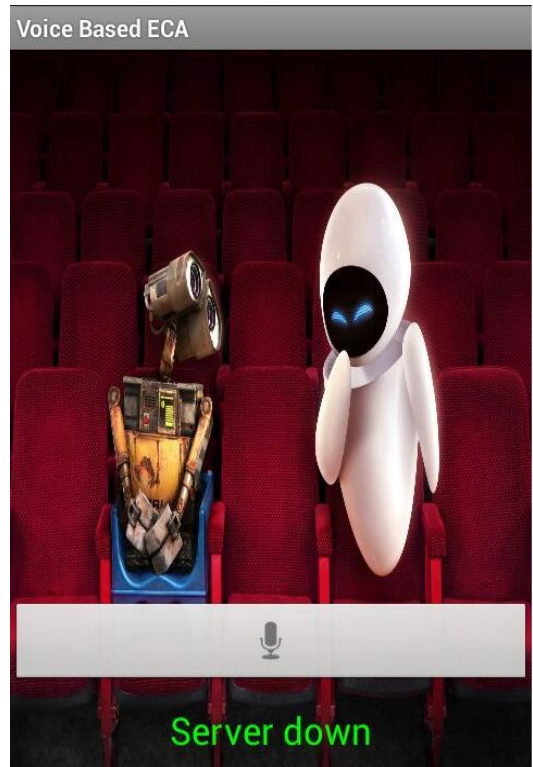
INTERRUPT	ACTION PERFORMED
0	OFF
1	ON

**List of modules used in application development are:**

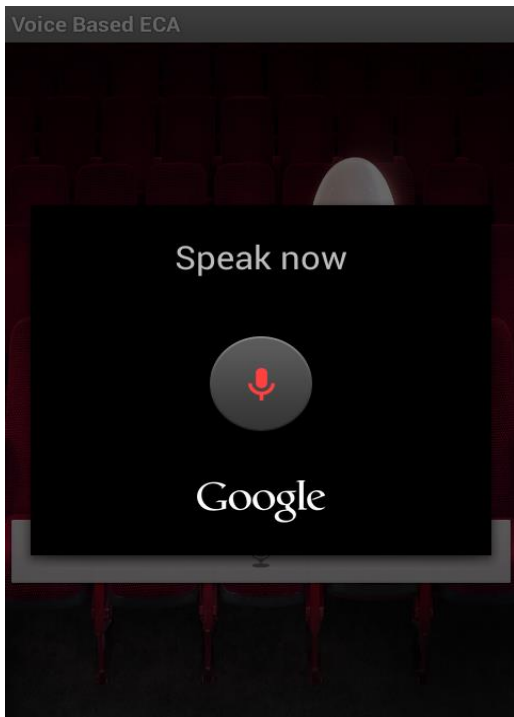
- **Voice Activity Detector (VAD):** The Voice Activity Detector role is to discriminate the user’s voice frames from those containing noise. This reads the digitized audio samples acquired from a microphone and sends the filtered raw audio to the ASR. The exact implementation of the VAD module is based on the Sphinx Base library, which was modified so it can work with the OpenSL ES native audio libraries present on Android.



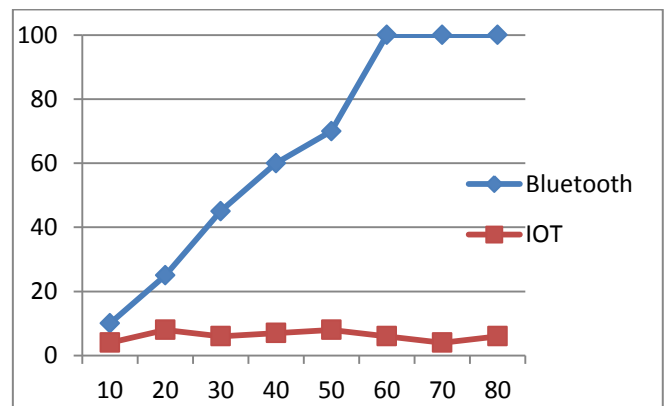
**Figure a :** ECA based android interface



**Figure c :** After giving speech input.(It shows "Server down" message because the application is not connected to server.)



**Figure b :** Speech is given as raw input.



**Figure d :** Performance graph for distance(x-axis) and connectivity failures(y-axis) occurring in Bluetooth and Internet of things

### III. RESULT AND DISCUSSION

This section describes the results obtained in the existing system. We propose this project for the development of wireless enabled smart systems that can control of

localized devices or device networks and to achieve seamless monitoring with a Smart Phone through exchanging of information between the Smart Phone and the managed devices. The hand-held devices has limited computational power compared then desktop computers. So the most common architectures for ECA-based mobile applications rely on an external server that performs the processor intensive tasks, such as speech processing, language understanding and text-to-speech. It designs mobile-based device monitoring and control, which can be applied in both fixed and moving LAN scenarios, such as vehicle electronics, power and energy systems, etc.

Speech is given as an input given through android application which is processed and converted into text and transmitted to a remote server through internet. Server on receiving the text compares it with the database and generates a corresponding interrupt signal. Using RS232 cable the interrupt signal is given to the micro controller. This in turns controls the device.

#### IV. CONCLUSION

We have portrayed a speech processing system which can control the remote device. The project which is presented is about speech to text conversion using the android application and with the help of an arm7 micro controller which generates interrupt to control the device. The advantage of this system is that it provides user interface. Using this, we can automate any devices like light, fan, irrigation motors etc. Expect voice and sound recognition technology to allow homeowners of the future to control the electronic devices inside of their homes by merely uttering a sound or word.

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