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Intelligent Device to Device Communication for Home Appliances Using IoT

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ABSTRACT

Device to device communication is very useful in field of IoT (Internet of Things). Analogous to the way humans use the Internet, devices will be the main users in the Internet of Things (IoT) ecosystem .Under this title we will be basically developing an automatic system for home appliances which will detect fault and generate alert using machine learning algorithm and IoT. In this paper various sensors are used to sense the parameter and the interfacing between hardware and home PC have been done in order to generate alert depending upon the values sensed by the sensor. This paper briefly describes the use of machine learning algorithm to predict the vendor depending upon the type of alert generated.

Keywords — ADC, Threshold, Logs, Threshold Range, Mining, and Vendor details, Device,Sensor , Channel

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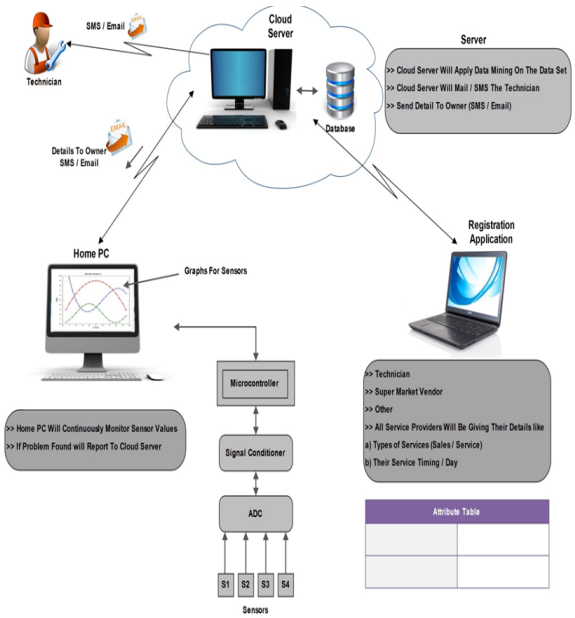
I. INTRODUCTION

Device to Device communication is an integral part of IoT environment. This communication can be also being made possible between different home appliances which we are using in our home. As we know with the rapid change in technology and busy schedule, it becomes an overhead for a person to manually check whether all their home appliances are working properly or not. It is really a hectic task to keep information about the status of all the devices. To manually detect fault in appliances and accordingly calling a technician to repair a particular devices consumes a lot of time. So in order to reduce theses kind of overhead there is a need to design a system which will automatically detect fault and will send notification about the fault occurrence to the particular technician using machine learning algorithm. An attempt is made to efficiently to use the machine learning algorithm to predict the available vendor.

II. PROPOSED SYSTEM



III.PROPOSED SYSTEM MODULES

1. **Hardware controller**
2. **Intelligent Server**
3. **Application Registration**
4. **Interfacing PC Application**

1.Hardware controller:

The hardware controller will have set of sensor and set of devices Connected to it. We have used 89C51 microcontroller for our system. This is one of the general purpose microcontroller used for various application like robotics, home application etc. It supports Harvard architecture and CISC instruction set. The 89C51 microcontroller is 8 bit controller and 40 pin IC. The microcontroller is having 5 interrupts. Along with the microcontroller we are using (0808ADC) for digital conversion purpose. ADC (0808) is 28 pin controllers. The ULN2803 device driver is also used which is capable of driving the high voltage.

2.Intelligent Server:

The intelligent Server will be the cloud server in our system. The functions of cloud server will be following:

- Data mining
- Send Mail/SMS Technician
- Send SMS to owner

The intelligent server will apply data mining technique on the database of registered vendors. After finding the probability it will send mail or SMS to that particular technician. On the other side the server will also send the details to the Owner of the home pc.

3.Application Registration:

Vendor information includes:

- Types of service they provide
- Service Timing/Day

The application registration will keep information about the registered vendors. The type of services and timing will be stored in the database.

4.Interfacing PC Application

- Monitor Sensor values
- If Problem generated report to the Server

The Home PC will continuously monitor the sensor value whether it crosses the threshold value or not. If the sensor value crosses the threshold value then it will send the report to the server.

IV. INTRODUCTION TO HARDWARE USED

A.Microcontroller-89C51

The AT89C51 is a low-power, high-performance CMOS 8-bit microcomputer with 4K bytes of Flash programmable and erasable read only memory (PEROM). The Atmel AT89C51 is a powerful microcomputer which provides a highly-flexible and cost-effective solution to many embedded control applications.It is a 40pin IC.

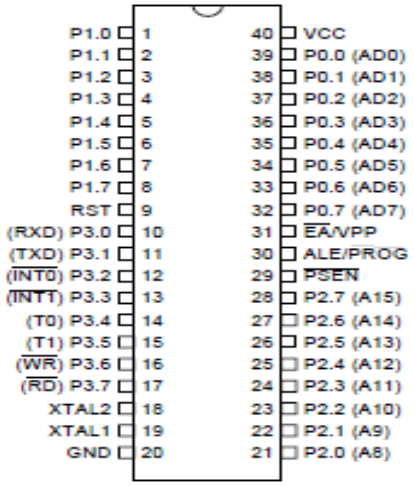


Fig1.89C51 microcontroller pin diagram

Specifications:

• Compatible with MCS-51™ Products
• 4K Bytes of In-System Reprogrammable Flash Memory
Endurance: 1,000 Write/Erase Cycles
• Fully Static Operation: 0 Hz to 24 MHz
• Three-level Program Memory Lock
• 128 x 8-bit Internal RAM
• 32 Programmable I/O Lines
• Two 16-bit Timer/Counters
• Six Interrupt Sources
• Programmable Serial Channel
• Low-power Idle and Power-down Modes

B.Max-232

The MAX232 IC is used to convert the TTL/CMOS logic levels to RS232 logic levels during serial communication of microcontrollers with PC. The controller operates at TTL logic level (0-5V) whereas the serial communication in PC works on RS232 standards (-25 V to + 25V). This makes it difficult to establish a direct link between them to communicate with each other.

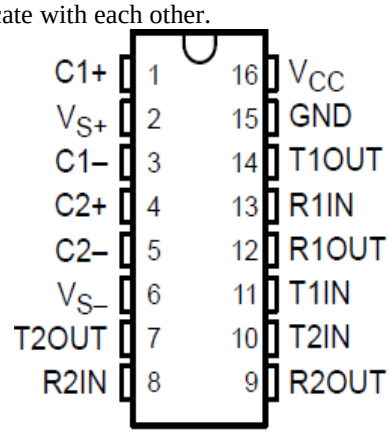


Fig 2. MAX-232 pin diagram

Specifications:

- Meet or Exceed TIA/EIA-232-F and ITU Recommendation V.28
- Operate With Single 5-V Power Supply
- Operate Up to 120 kbit/s
- Two Drivers and Two Receivers
- ±30-V Input Levels
- Low Supply Current . . . 8 mA Typical
- Designed to be Interchangeable With
- Maxim MAX232

- ESD Protection Exceeds JESD 22
  - 2000-V Human-Body Model (A114-A)

C.ULN2803 Device driver

Featuring continuous load current ratings to 500 mA for each of the drivers, the Series ULN28xx high voltage, high-current Darlington arrays are ideally suited for interfacing between low-level logic circuitry and multiple peripheral power loads. Typical loads include relays, solenoids, stepping motors, magnetic print hammers, multiplexed LED and incandescent displays, and heaters. All devices feature open-collector outputs with integral clamp diodes.

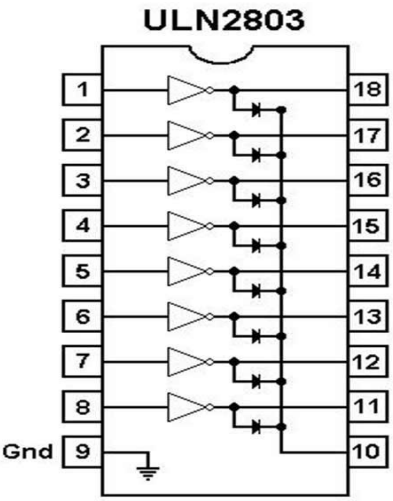


Fig 3. ULN2803 pin diagram

Specification:

- TTL, DTL, PMOS, or CMOS Compatible Inputs
- Output Current to 500 mA
- Output Voltage to 95 V
- Transient-Protected Outputs
- Dual In-Line Package or Wide-Body Small-Outline Package

V. ALGORITHM

Naïve Bayes :

The Naïve Bayes model is a heavily simplified Bayesian probability model. In this model, consider the probability of an end result given several related evidence variables. The probability of end result is encoded in the model along with the probability of the evidence variables occurring given that the end result occurs. The probability of an evidence variable given that the end result occurs is assumed to be independent of the probability of other evidence variables given that end results occur

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Naïve bays implementation Steps:

1.Calculate prior Probabilities of class to be predicted

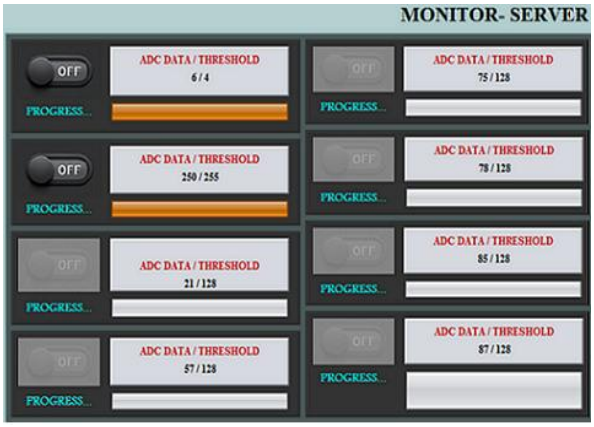
2.Calculate conditional probabilities

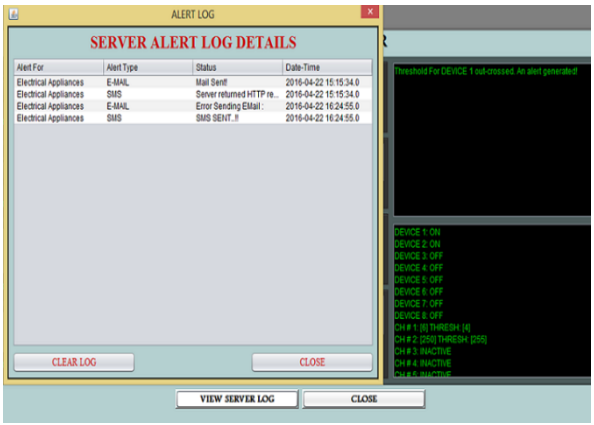
3.Calculate posterior probability

4.Highest probability among above is predicted class for query tuple.

- Prior probability =P(X)/P(Y)
- P(X)=No of occurrences for tuples
- P(Y)=Total no of tuples
- Conditional Probability=P(X|Y)=P(X and Y)/P(Y)
- Where P(X|Y) represents conditional probability
- Posterior Probability= (Prior Prob * Cond Prob)

VI. RESULT AND ANALYSIS





VII. CONCLUSION AND FUTURE SCOPE

In this project using sensor parameter and m/c algorithm, a system has been developed which will atomize the fault detection & auto notification to the technician. D2D communication is an integral part of the IOT environment to design, deploy,and maintain a sustainable IOT ecosystem.In this software development four modules have been implemented that will make system automatic and inteeligent to find the probability of available and more preffered vendor.The developed system can be deployed for home appliances and in industries also.In order to optimise and time area wise clustering can be implemented for the vendors .In furture if need to add more number of devices then it can be achieved using relay. Security can be achieved by classifying the vendors according to gender.

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