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# Use of RFID Technology and Voice-Controlled Devices in Medical Institutions

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**ABSTRACT**: RFID technology is one of the growing technologies and if used well, it can do wonders in many fields, especially medicine. In this paper, an idea improving the current status of medicinal institutions worldwide through automation and robotics has been propounded. Along with the use of RFID technologies in medicinal institutions instead of prescriptions and other data, this paper also gives a solution to some of the general problems in medicinal institutions by giving an organized method of the working of medicinal institutions through automation. Further, the use of voice-controlled sensors like temperature sensor and pulse rate sensor has also been given which will provide ease to the doctor.

**KEYWORDS:** RFID (radio frequency identification) technology, medicinal institutions, voice-controlled sensors, eliminating use of prescriptions.

### I.INTRODUCTION

Medicine is one of our most important requirements in today's world with so many complications and diseases coming up. It is a field which is prevalent all around the world. In our project, we have given ideas to improve the technology which is used in medical institutions by the use of robotics. We have tried to replace the old system of paper prescriptions with RFID technology and further, we have used voice-controlled sensors to make the work of the doctor easier.

### **II.PROBLEMS FOCUSED**

Following are some of the problems in medicine on which our primary focus is-

1) Lot of paperwork required during prescriptions and reports

2) Too many reports and prescriptions have to be stored by the patient

3) Retests required if patient loses his reports and if the reports are required

4) Doctor has to do the same tests on many patients like heartbeat and temperature which is too tedious if done manually

5) Deterioration of the patient's health if forgets or loses his prescription since he is not given medicines (except general medicines) at the medical store

These problems need to be focussed upon to make the work of the doctors and patients easier.



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### III.RELATED WORK

We have used RFID technology instead of paper prescriptions and voice controlled sensors which will eliminate all the above mentioned problems. RFID tags would serve as prescriptions which can be updated. Thus, paper prescriptions and reports in the hospital would no longer be needed since everything would be updated on the RFID tag. Since the medical stores would also have the RFID readers, paper prescriptions would no longer be needed. Using the application software on his device, the doctor would control the temperature and heartbeat pulse rate sensors which would be present on the band which would be placed on the patient's arm. Only by saying the word 'next', the doctor would be able to signal the next patient to come in because of the change in number on the LCD screen in the waiting room. Thus, voice would be a characteristic part of this system. In this manner, a onetime set-up would be enough to eliminate the problems given and make the work of the doctor and patient easier.

### IV.BLOCK DIAGRAM

The following Block Diagram is to show the signals sent by the Microcontroller, RFID Tag and various other components and the relation between them in the working of the program:



### V.COMPONENTS USED

**Microcontroller** – A microcontroller consists of the main processing and controlling unit of the system. All the input and output devices used in the system are interfaced to the Input / Output (I/O) pins of the microcontroller and the program for execution is stored in the memory of the microcontroller. The microcontroller used in the project is ATMEL ATMEGA256. The controller has up to 256 Kb of memory to store instructions, 8 bit processing unit and more than 50 interfacing pins for external modules. Fig 2 shows the microcontroller which we have used.



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Fig 2- Microcontroller-It coordinates the various devices which are used.

**Pulse Sensor** – The Pulse Sensor is a plug-and-play heart-rate sensor for Arduino. It can be used by students, artists, athletes, makers, and game & mobile developers who want to easily incorporate live heart-rate data into their projects. It consists of an LED and LDR. LED transmits light which is reflected by blood cells and received by the LDR and based upon the intensity of the light received the pulse rate is calculated. It has been used to measure patient's pulse rate when required. Fig 3 shows the pulse sensor which we have used.



Fig 3 - Pulse Sensor-It is uses to measure the pulse of the patient.

**Temperature sensor** - The LM35 is one kind of commonly used temperature sensor that can be used to measure temperature with an electrical o/p comparative to the temperature (in °C). It can measure temperature more correctly compare with a thermistor. This sensor generates a high output voltage than thermocouples and may not need that the output voltage is amplified. The LM35 has an output voltage that is proportional to the Celsius temperature. The scale factor is  $.01V/^{\circ}C$ . It is used to measure patient's temperature. Fig 4 shows the temperature sensor we have used.



Fig 4 - Temperature sensor-It is used to measure the temperature of the patient. By programming it can be made to display the temperature on the Serial Monitor.

**LCD** (Liquid Crystal Display) - A liquid crystal display (LCD) is a thin, flat electronic visual display that uses the light modulating properties of liquid crystals (LCs). They do not emit light directly. They are used in a wide range of applications including computer monitors, television, instrument panels, aircraft cockpit displays, etc. They are



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compact, lightweight, portable, inexpensive, reliable, and easier on the eyes. The LCD module used in this idea has a 16\*2 display screen. It has been used to indicate the next patient to come in. Fig 5 shows the LCD which we have used.



Fig 5 - LCD I2C (Liquid Crystal Display) – It is used to display the patient number.

**RFID Reader** – Radio-frequency identification (RFID) uses electromagnetic fields to automatically identify and track tags attached to objects. An RFID reader transmits an encoded radio signal to interrogate the tag. The information on the tag can be read by a RFID reader if suitable programming is one. Fixed readers are set up to create a specific interrogation zone which can be tightly controlled. This allows a highly defined reading area for when tags go in and out of the interrogation zone. Mobile readers may be hand-held or mounted on carts or vehicles. Readers must be connected to a battery source. Fig 6 shows a RFID reader.



Fig 6- RFID reader - It is used to read the data on the RFID tag of the patient.

**RFID Tag** –An RFID tag contains electrically stored information. RFID tags contain at least three parts: an integrated circuit that stores and processes information and that modulates and demodulates radio-frequency (RF) signals; a means of collecting DC power from the incident reader signal; and an antenna for receiving and transmitting the signal. When the RFID tag receives the message of the RFID reader, it responds with its identification and other information. This may be only a unique tag serial number, or may be product-related information such as a stock number, lot or batch number, production date, or other specific information. Since tags have individual serial numbers, the RFID system design can discriminate among several tags that might be within the range of the RFID reader and read them simultaneously. RFID tags are used in many industries. For example, an RFID tag attached to an automobile during



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production can be used to track its progress through the assembly line; RFID-tagged pharmaceuticals can be tracked through warehouses; and implanting RFID microchips in livestock and pets enables positive identification of animals. Fig 7 shows a RFID tag.



Fig 7 - RFID tag – It stores the data of the patients and can be edited if required.

#### VI.IMPLEMENTATION AND RESULTS

Fig 8 shows a prototype model of the project equipped with all the components given in Section V.



Fig 8 - Prototype of the Project – A successfully working prototype which had been made by us.

The setup for this project is such that once it is set, it can work consistently for a long period of time. Instead of written prescriptions, this system uses RFID tags. These RFID tags can be edited easily by an attendant using a laptop/PC on which the program would already be present and must only be run to edit the contents of the RFID tag. When the patient enters the medical institution, his RFID tag would be scanned and his data would be passed on to the doctor's device (laptop/PC) via Wireless Fidelity when the patient's turn would come. The patient would be assigned a number and when that number would be displayed on the LCD screen, it would be his turn. The doctor would already have the patient's information even before the patient enters the room by the above mentioned technique. When the patient would be activated when the doctor would say 'temperature' or 'heartbeat' in application software which would be open on his mobile phone. The patient would need to wear a strap for the measurement of temperature or pulse rate. When the doctor's work with the patient is done and the patient has left the room, the doctor can see the next patient's data which he gets from the patient's RFID tag through Wi-Fi and when he says 'next', the number on the LCD screen would increase by 1 which would update the information on the patient's RFID tag according the doctor's report. If it is the first visit of the patient, he can be given a RFID tag and the information of the patient can be uploaded to it. The



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database of all hospitals can be linked with a common database so that anywhere where the patient goes, his data would be available and he would not have to carry his reports and the doctor would already know about his problems which would be there in his RFID tag. The medical stores can also use this information to give the patient the medicines which would be prescribed by the doctor and would be uploaded on the RFID tag of the patient. Programming is an integral part of this project. Programs have been written for reading the RFID tag through the RFID reader, putting information in the RFID tag and to edit it if needed, making the sensors voice-controlled, and for displaying and changing the patient number on the LCD.A sample of the program code which we had written is given in Fig 9.



Fig 9 - A sample of the program code which was running the prototype.

### **VII.FUTURE ENHANCEMENTS**

In the future, we can make a program which would allow only certain users like doctors and medical stores to see the information in the database for safety purposes. More accurate sensors can be used. Aadhar cards can also be linked to it by the use of better technology for better identification.

#### VIII.CONCLUSIONS

Hence, this report gives an efficient use of robotics in the field of medicine. It provides a deep insight on the use of automation, especially RFID technologies, in medicinal institutions. The target of this robotic solution is to provide ease to patients and to help the doctors through voice controlled technologies and automation.

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