# A Novel Multi Purpose Robotic Dispenser with Database Management System

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**Abstract— this paper presents the working of a multipurpose robotic dispenser with "medicine dispensing application". The focus of the project is to build an economic, easily deployable, mobile medicine dispenser with Database Management system. Mobility in the dispenser is inherited from line-follower mechanism.**

**The robot is built around a microcontroller which takes input from a computer (serially) and moves the robot to desired location and manages dispensing mechanism. The dispenser mounted on the robot is self-manufactured with the help of DC motors, which substantially reduces the cost of overall system, to deliver the desired medicine.**

**The purpose of the project is to dispense three different medicines to three different patients as seem obvious with three circular discs mounted on top. In order to deliver medicine to three different locations, mobility in the project is introduced and is accomplished through line follower which follows the path with its true ability. Three circular discs are controlled through DC motors. Its design is such that a single tablet is dropped implying one tablet in one revolution. The dispenser gets the command through serial port from a computer and satisfactorily dispenses the medicine to desired patient.**

*Keywords— Line-follower, robotic dispenser, microcontroller, infra red sensor, automation.*

## I. INTRODUCTION

The project aims to automate delivery systems in various walks of life. It provides a smart dispensing mechanism for various situations. Our focus will base upon a hospital scenario.

The intended approach is to feed medicine entries, (type and quantity) through a central database to the robot which will then move towards its destination (ward and/or bed). The dispenser which is located at the top of the robot will then dispense tablets (and syrups) through small and strategically placed trays and circular discs.

The Database of medicines (patient's history) is maintained in mySQL whereas the patient's information (location) to be fed in robot is kept in a separate application constructed using Visual Basic 6.0, which also communicates with robotic dispenser serially. The dispenser works in cooperation with the tools, Visual Basic 6.0 and C#, to make the system user friendly and usable by providing a GUI for Doctors and Nurse or staff.

[1] Only prototypes exist. Those that exist are very expensive, and more importantly they are not mobile either. So our aim is to make it economical, introduce mobility and put a step further in making it intelligent and secure.

The project itself is Low cost, rugged, easily deployable, easy operation. The purpose of the project is to automate the process of Dispensing, reducing labour load and eliminating human error.
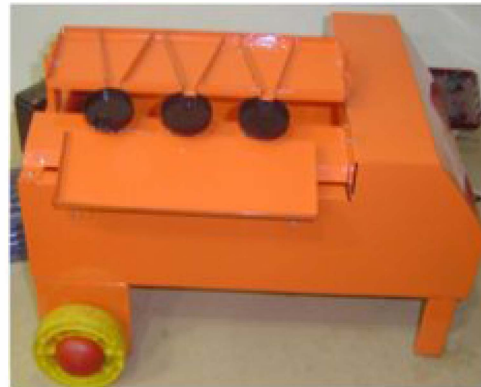


*Fig.1 Mutipurpose Robotic Dispenser*

There are two main parts of the project namely line follower and the dispenser.

## II. Line Follower

A line follower simply Senses a line with the help of two infra red sensors mounted at front of smart car and make its way by judging the boundaries of the line by calculating voltage difference.

In our case, we included a feature to the traditional line follower, that is, the front wheel is controlled through microcontroller, sensors work on colour combination and steers the front wheel accordingly. When left sensor encounters a white line, the wheel will steer left. Similarly, when right sensor encounters a white line, the wheel will steer right. When both sensors encounter white line, then it is the microcontroller that instructs whether to take a straight path or turn left. The best case scenario is when the line follower is on the line. It simply follows a line and moves accordingly that is it encounters a straight path and move towards the destination

unless and until both sensors encounter a white line. Since we are dealing with real world scenario, it is obvious that we are not going to encounter straight lines always but rather some curves as well. When a line follower encounters a curve, one of the side sensors will move away from the line. And the motors attached with the sensor slow down so that a smooth turning takes place.

### III.     Robotic Dispenser

Dispenser is the main and the most important part of the project because the actual functionality of project lies in it.
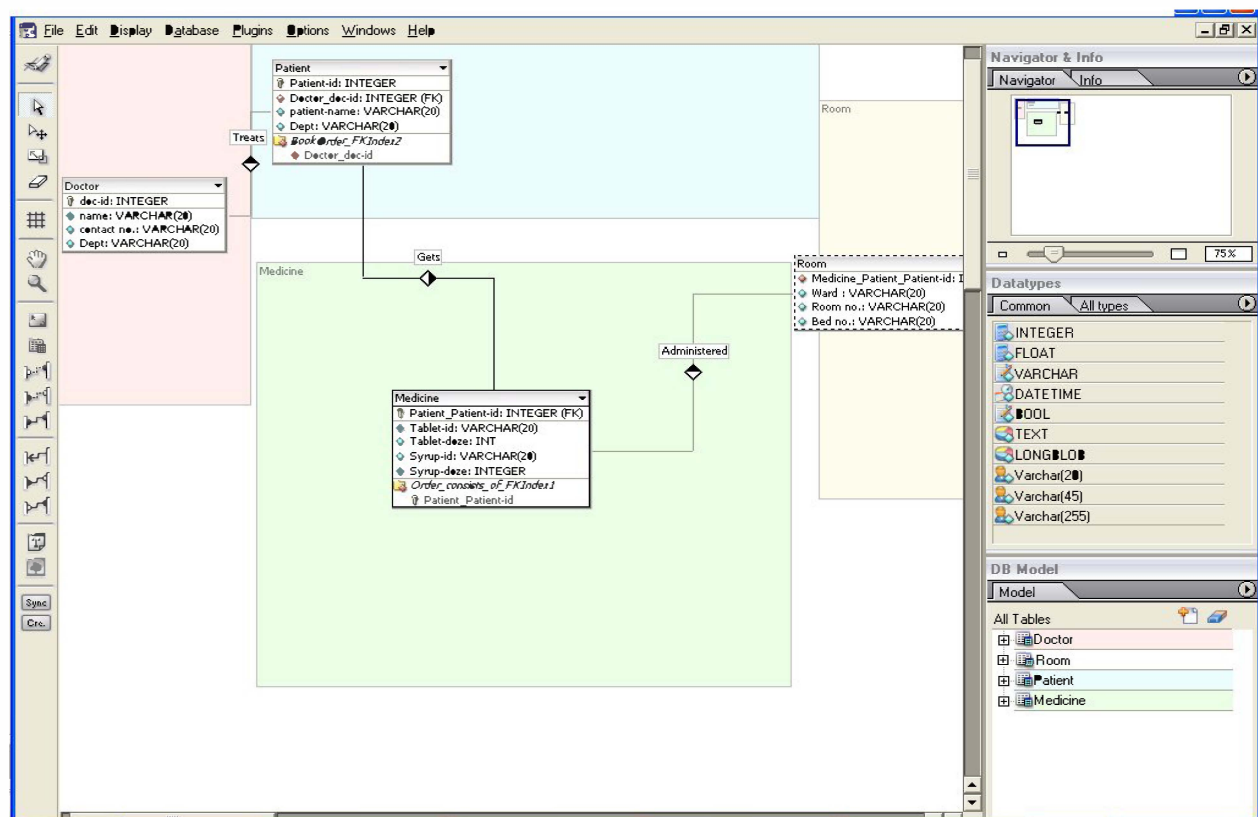
A serial port is used to send data to microcontroller with the help of visual basic. The operator or staff (from hospital) will "check" the desired tablets available in GUI. The robotic dispenser will go in the mentioned room(s) and dispenses the "checked" medicine to patient. When the desired medicine is dispensed, microcontroller looks whether or not another patient needs a medicine. If it encounters to go to next patient it will dispense medicine otherwise it will come back to its original location.

### A.    SOFTWARE DEVELOPMENT

The term software development does not mean that we made our own software but rather the tools that are used to make this project cheap, and usable. Nurse or ward boy on the other hand can only gives medicine and provide records to doctor.

With the help of entity diagram, we create our database. Like we get an overview of what exactly we are trying to make. SQL is cheap and free. Free in a sense that it does not require licensing from its users. It is user friendly. It is a service that is used worldwide. These are the reasons why we chose it. SQL is used to maintain the database in robotic dispenser. Database is one of the main component of robotic dispenser, data entries that are already fed to patients and that are about to be provided are stored there. Records of patients can be seen at any instance for examining what exactly is going on.

The front end of robotic dispenser is solely based on Visual Basic. It provides GUI for Doctor, nurse or staff from hospital. It works as an interface for doctors and nurses or staff. Forms are made to make it usable or user friendly. There will be a screen which is used to tell the robotic dispenser to dispense the desired medicine by "checking" or "marking" to the desired patient. We use C# to tell the robotic dispenser which room to go and what medicine to dispense.

Making a database becomes more simple and sophisticated. Microcontroller is like a computer for me in the project. It does the processing, manages tools and used to automate the delivery of medicines. There is only a single controller in project which does the functionality of a microprocessor on a small scale.



*Fig 2 Entity Diagram*

DATA FLOW DIAGRAM

Data flow diagram is same as a flow chart. In flow charts, we discuss processes or steps to follow in a sequential manner whereas in data flow diagram, we talk about inputs and outputs with regards to processes.

At the very earliest, it is required to access the mechanism in order to deliver tablets, syrups and medicine in general. To make the system secure, a login feature is enabled to access the dispensing system. After successful login, user ids are provided automatically through SQL and it gets authenticated. In the meanwhile, the process of generating report i.e. activity

And finally, after logging in and getting the respective user ids and doctors information with the need of checking medicines from inventory and/or storage department, the system will generate the report about all these activities which will then be printed if desired.

IV.    USE CASE MODEL:

Use case model defines the interaction between user and system. In the use case model, we have a secure environment because this is a matter of someone's life. Dispensing a wrong
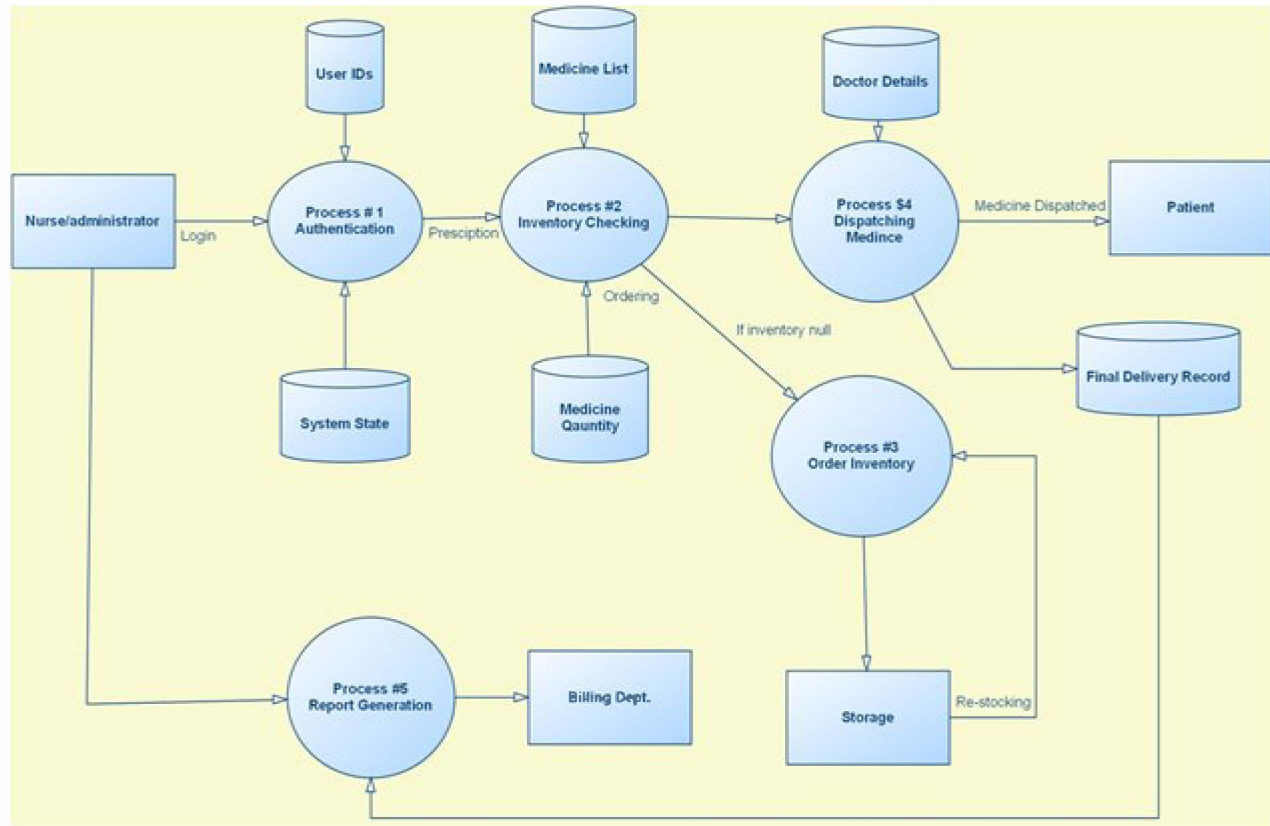


which is under process with the desired patient is kept.

*Fig 3 Data Flow Diagram*

We again have another input named medicine list which is then checked whether the medicine is available in inventory or not. When the desired prescription is added then the concerned doctor's information is also displayed.

In the meanwhile, system state is checked whether the desired login was provided or not or whether we have sufficient medicines available in the inventory or not like quantity or the desired dosage for patients. If it is still not present in the inventory section then it will be available from the store department which we mention storage.

medicine will be costly. So only an administrator can access the database, update the inventory of the Robotic Dispatcher and deletion of data. A nurse or a ward boy on the other hand can only gives medicine and provide records to doctor.
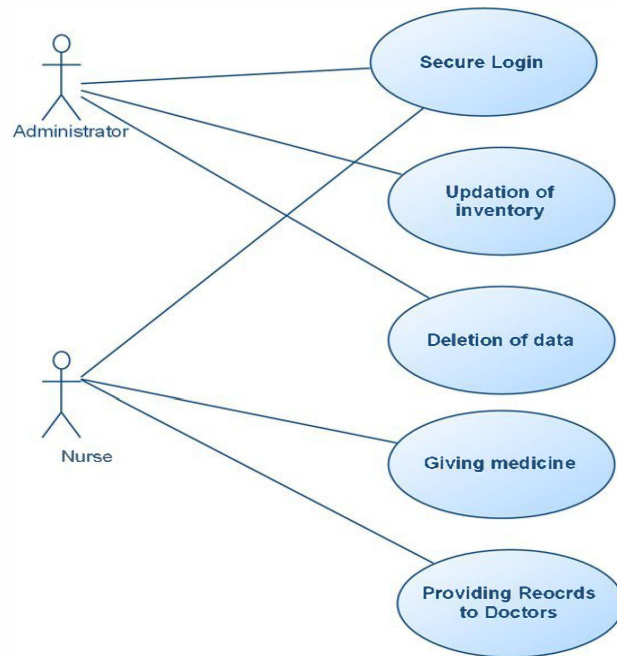
Fig 4 Use-Case model for DBMS Medicine Delivery System

## V. FUTURE PROSPECTS, DISCUSSION AND RECOMMENDATIONS

### A. Modification in Existing Project

Since, it is a prototype and efficiently worked for three tablets and three patients. It can work for $n^{th}$ number of medicines and $m^{th}$ number of patients where n and m are integers.

### B. Collision Detection and Avoidance

The technique that we used is termed as "Line Following". Collision detection and avoidance is another prospect of finding a path from source or origin to destination. Sensors are available for such purpose; it is just a matter of making them work for our required scenario.

### C. Camera to Follow Line

Instead of line following and Collision Detection and Avoidance, we can have image processing to make it more realistic. But the process gets slow down.

### D. Wireless Data Transmission

The need to make things wireless is what the world is heading towards. Wirelessly transmitting data will be helpful when a robotic dispenser has left origin and suddenly there is a need to send it to some other patient. Then how will you do that? Here comes the use for wireless technology, may be RF modules for instance.

### E. Making Robotic Dispenser Smarter

The future prospect of robotic dispenser as we see from now is to make multiple robotic dispensers communicate with each other. This is possible by using RF modules or any other wireless means of communicating.

### F. Smart Inventory

Rather than filling the dispenser manually, it is also possible to make the inventory and robotic dispenser as well smart enough to communicate directly with the help of additional commands.

REFERENCES

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