# IDEA -2017-IC-02
# Autonomous and Intelligent Shopping Trolley


Submitted By

**Patel Vidhiben Kiritbhai (14BIC039)**




**INSTRUMENTATION AND CONTROL**

**INSTITUTE OF TECHNOLOGY**

**NIRMA UNIVERSITY**

**AHMEDABAD-382481**



**APRIL-2018**

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# Autonomous and Intelligent shopping trolley

**Idea Lab Project**


Submitted By

**Patel Vidhiben Kiritbhai (14BIC039)**

Under the mentorship of

**Prof. Vishal Vaidya**




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# Declaration

We do hereby declare that the technical project report submitted is original, and is the outcome of the independent investigations/research carried out by us and contains no plagiarism. The research is leading to the discovery of new facts/techniques/correlation of scientific facts already known. This work has not been submitted to or supported by any other University or funding agency.

We do hereby further declare that the text, diagrams or any other material taken from other sources (including but not limited to books, journals and web) have been acknowledged, referred and cited to the best of our knowledge and understanding.

Date: 21 April, 2018
Place: Ahmedabad

| | | |
|---|---|---|
| Vidhiben Patel | Prof. Vishal Vaidya | Prof. Sandip Mehta |
| (14BIC039) | Project Mentor | IdeaLab Co-ordinator |

**NIRMA UNIVERSITY**

**INSTITUTE OF TECHNOLOGY**

**IDEA LAB**

**INSTRUMENTATION AND CONTROL**

**Annual/Final Report of the work done on the Idea Lab Project.**

**(Report to be submitted within 3 weeks after completion of the project)**

1. Idea Lab Project ID: IDEA-2017-IC-02

2. Project Title: Autonomous and Intelligent shopping trolley

3. Period of Project: 5th April 2017 to 5th April 2018

4. Name of Student (Roll No.): Patel Vidhiben Kiritbhai

   Department: Instrumentation and Control

   Name of Mentor: Prof. Vishal Vaidya
5. Project Start Date: 5th April 2017
6. (a) Total Amount Approved: Rs. 20,000/(b) Total Expenditure: Rs. 19,315/-

   (c) Report of the work done:

   i. Brief objective of the project: To provide a solution for time consuming shopping problem.
   ii. Work done: Researched and developed the prototype of Autonomous and Intelligent shopping trolley .
   iii. Results achieved from the work

   iv. Indeed, we have achieved all our goals within the provided time limits.

   v. Long duration of quotation approval and prohibition of online purchase.

   vi. During this course of the Idea lab project I learned about synchronization of magnetometer sensors and working of RFID for uniqueness of sensing product.

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(14Bic039)

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# Contents

## 1.1 Introduction

Now a days, offline shopping market goes down just because people does not like to wait in a queue for hours. Everyone likes speedy response weather it can be anything. The idea was to provide the autonomous solution for the very same.

## 1.2 Literature Survey


Each one had its pros and cons. Most of these systems required a large database, high processing power and had large process lags. During our survey we came to know about a preexisting solution for our problem. Our prototype is known as smart trolley which can sense all products and display it on LCD screen. Adding to it , it follows the customer uniquely. All this features done at very cheaper rate. There are many solutions available in the market but they all are available at very higher rate as well as they have very high power consumption. I did a survey on many autonomous trolley but they all have used very costly HD cameras for the product. Whereas my system uses magnetometer which is available at very cheaper rate.

## 1.3 Major Objectives Proposed

State Looking forward to the problem present in the market. The Project had to deliver the following objectives:

- Autonomously working mode made by combine use of RF transmitter/receiver with antenna along with ultrasonic distance sensor.
- Very less time consuming process
- Independently provides withdraw facility
- LCD monitoring
- Digital billing
- Provides solution against theft

## 1.4 Objectives Achieved

Of all the objectives mentioned above, we have successfully achieved many of them. like,

- A Shopping trolley which can sense all the products .
- Provides LCD monitoring.
- Works Autonomously.
- Fast sensing process.
- Theft security.
- Withdraw facility.

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## 1.5 Objectives Not Achieved

Due to many constraints like budget limit, product is not available in the stores we are not able to achieve some features as follows.

- RFID of 1 meter range has not been found so multiple of small range need to be used.
- Unique follower mode has not been possible by using ultrasonic as it can not understand person is detected or object.
- Trolley movement is not smooth on some surfaces.
- No provision for manual mode if system electronic fails.

## 1.6 Technical Difficulties Faced

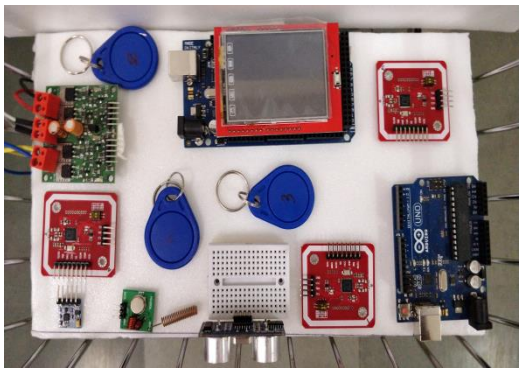
RFID Range: As the passive RFID system for required range was way more expensive for the project we had to move on to a cheaper module but problem with that we have to use very nearer range receiver and to make project work properly we use 3 RFID module.

## 1.7 Experimental Setup and Results

As I have prepared model for shopping trolley which contains following sensors for different use.

1. High Torque DC motor 60 RPM: To provide maximum torque for 5-6 kg payload.
2. RF super regenerative module 433Mhz Transmitter + Receiver: To serially transmit data from the magnetometer to the receiver.
3. HMC5883L 3Axis Compass Magnetometer Module: To get the customer data in the form of degree.
4. Dual DC motor driver 20A: To provide required current to motors.
5. PN532 NFC RFID Module V3 kit reader writer breakout board: To detect the product which has RFID tag.

One magnetometer will be given to a customer and another will be placed in a trolley. Magnetometer which is given to a customer send a data through RF module and that data will be received by receiver which is placed in a trolley. Another magnetometer which is placed in a trolley also takes the data and both data will be matched. Synchronous method of both magnetometers is used to take the action and according to that trolley will follow the customer. Adding to it RFID module which contain transmitter tag as well as receiver which will be used for sensing products.



## 1.8 Budget Analysis

1. Budget Sanctioned: Rs. 20,000/-

2. Budget Utilized: Rs. 19,315/-

| Sr. No. | Item Description | Approx. Price per unit (Rs.) | Quantity | Total in Rs. |
|---|---|---|---|---|
| 1. | Square basket | 450/- | 1 | 450/- |
| 2. | Fabrication on basket | 1200/- | 1 | 1200/- |
| 3. | High Torque DC motor 60 RPM | 944/- | 2 | 1888/- |
| 4. | Arduino Mega 2560 R3 Board(with USB Cable) | 790/- | 1 | 790/- |
| 5. | Arduino Uno R3 Board (with USB Cable) | 470/- | 1 | 470/- |
| 6. | Proto shield for Arduino Uno with Breadboard | 150/- | 1 | 150/- |
| 7. | RF super regenerative module 433Mhz Transmitter + Receiver | 120/- | 1 | 120/- |
| 8. | Antenna for 433Mhz RF Module | 60/- | 2 | 120/- |
| 9. | HMC5883L 3Axis Compass Magnetometer Module | 400/- | 5 | 2,000/- |
| 10. | Dual DC motor driver 20A | 650/- | 1 | 650/- |
| 11. | Lithium Polymer (LiPo) rechargeable battery 11.1 V 3300 maH | 2,950/- | 1 | 2,950/- |
| 12. | Motion detection module based on HB100 Microwave Sensor | 1,650/- | 1 | 1,650/- |
| 13. | PN532 NFC RFID Module V3 kit reader writer breakout board | 690/- | 3 | 2,070/- |
| 14. | RFID keychain tag compatible with EM4100 | 30/- | 5 | 150/- |
| 15. | 2.4 Inch Arduino Touch LCD Shield | 450/- | 2 | 900/- |

| | | | | |
|---|---|---|---|---|
| 16. | Arduino Uno R3 based 20A Robot Control Board | 1,350/- | 1 | 1,350/- |
| | Total GST (18%) | 2,695/- | - | 2,407/- |
| | | | Total | 19,315/- |

Budget remains: Rs. 685/-

## 1.9 Conclusion and Future Work

As the project name "Autonomous and Intelligent Shopping trolley", it serves all purposes. It reduces time consumption in the shopping. Moreover it follows the customer with unique identity. This prototype can be integrated by adding some more features like bill payment option through bank account directly and bill will be goes to customer's mobile phone as well as to the system.

# Bibliography

Robokits.com

https://www.theglobeandmail.com/globe-drive/culture/technology/autonomous-shopping-cart-that-doubles-as-a-grocery-store-assistant/article28398502/

https://www.insideretail.com.au/blog/2018/01/02/fully-autonomous-shopping-cart-launched-in-us/