RFID BASED WIRELESS INVENTORY MANAGEMENT SYSTEM

Team Members :

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We present the PN532 reader, a light-weight wireless tag scanner for inventory controllers to simplify tracking inventory and conducting regular audits.

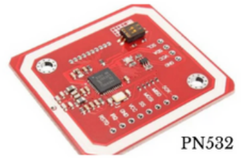
Demo Video

Overview of methodology

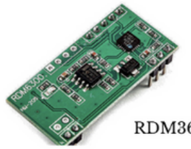
- We started with PN532 and Raspberry Pico pi W because of it’s size and compatibility and tried to reproduce it with slight changes to increase its range.
- We succeeded in doing that and improved the range and read tag even after putting some obstacles in between.
- Tried to interface software and hardware using Google Sheets which also serves as the database for our inventory.
- Could do that using micropython as hardware language but our target was to code using assembly C language.
- To make the whole structure compact, connect the microcontroller to the reader part on the PCB itself and make a frame accordingly incorporating the supporting equipment.
- Could integrate the microcontroller and reader and read the tag without any change in the range.
- Tried to power the whole setup from batteries externally and make a charging set up to charge batteries.
- Successful in powering up the whole setup using batteries and made charging setup for batteries and an indicator for it.

Flow Chart of Planning

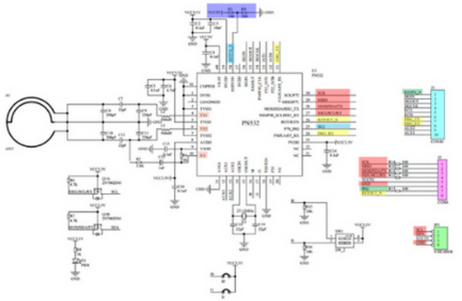
Conducted thorough research on RFID technology to understand its principles and applications


PN532


RC522


RDM3600

Evaluated different RFID reader modules and selected the PN532 due to its superior advantages



Studied the PCB design of the PN532 module and successfully reproduced it, with some modifications to enhance range

Implemented modifications to the PCB design to increase the RFID reader's range for better performance

HARDWARE

GOOGLE SHEETS

SOFTWARE

Provided necessary power to the system using batteries to ensure portability and uninterrupted operation

the system using batteries to ensure portability and uninterrupted operation

Optimized the CAD design by integrating the Raspberry Pi and antenna on the same PCB, enhancing functionality and reducing space requirements

Challenges faced and how we solved them

challenges	solutions	remark
fitting the components inside the loop of antenna and making the system compact	Increase the antenna size and decrease the width	Failed
Hardware coding in C language	Code in micropython and convert it into C	failed
charging the battery	use TP5100 IC and Li ion batteries	successful
visual realisation of tag detection	put an LED to nlink for tag detection	successful
Making an app to acess the tag number	Made a website and turned it into an app	successful

Some examples of problems solved

The commercial PN532 module has a very short range, but our PCB /reader module needs to have a good range so that it can detect the cards even after putting a laser-cut frame.

- **We could increase the range of the module by increasing the antenna size and accordingly made changes in the matching circuit of the antenna design available online.**
- **Range 5-6 cm for bare PCB and with acrylic sheet(3 mm width) upto 4.5cm**

Individual contributions

Member	Contributions made over entire duration of project	Average hours spent on EDL per week in Jan and Feb 2024 (1st half)	Average hours spent on EDL per week in March and April 2024 (2nd half)
Soumyadeep Jana	back end & app development and battery management	6	18
Om Unhale	PCB and CAD designing & battery management	5	20
Kadiyala Sai Susrush	Hardware coding	5	20
Prince Kumar	Front end, soldering SMD components and maintaining work history	4	15

Conclusion

- **Key Functionalities**:-

1. Our device can read the RFID tag contactlessly with a considerable range with visual confirmation.Our app has the functionalities manage inventory system smoothly.Device is portable and chargable with normal 12v DC adapter.

- **Key lessons learnt**:- Device never works in the first trial and you need to modify it by finding out the error.
- **Key gaps**:- Make the device user-friendly by attaching an handle and modifications in shape like a gun.Improve the size aspect of the reader module.

Acknowledgments:- We want to thank Siddhart Tallur sir, Rajbabu sir, Ankur sir, Mahesh sir, Suraj sir, Mangesh sir, WEL lab RAs for guiding us.