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# FINGERPRINT SUITCASE

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Project Report



GROUP B  
Engineering Design

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# ACKNOWLEDGMENT

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WE WOULD LIKE TO EXPRESS OUR DEEPEST GRATITUDE TOWARDS OUR ENGINEERING DESIGN INSTRUCTORS, DR. AMIT SHARMA & DR. ABHILASHA MAHESHAVARI, WHO GAVE US THIS OPPORTUNITY TO INNOVATE SOMETHING, WE WOULD ALSO LIKE TO EXPRESS A SPECIAL THANKS TO DR. ARPIT Khandelwal AND DR. ARANI ALI KHAN FROM ELECTRICAL DEPARTMENT OF IIT JODHPUR TO GUIDE US THROUGHOUT THIS WHOLE PROJECT, ALSO WOULD LIKE TO THANK ALL THE LAB STAFF AT THE MECHANICAL WORKSHOP OF BASIC LABS BUILDING TO HELP US FINALLY ASSEMBLE EVERYTHING, WITHOUT THERE HELP IT WOULD HAVE BEEN TOUGH TO COMPLETE THE PROJECT. AND LASTLY, WE THANK OUR WHOLE TEAM FOR ALWAYS WORKING ON THE PROJECT.

## Special Thanks to:

- Dr. Arpit Khandelwal
- Dr. Arani Khan
- All the staff at Basic labs Mechanical Depp. Workshop
- Our Whole Team
- Dr. Amit Sharma
- Dr. Abhilasha Maheshwari

## Members

- Neermita
- Aaditya
- Harish
- Prince
- Aiswarya
- Khushi
- Kanishk

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# Problem Statement

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MANY TIMES SIMILAR-LOOKING SUITCASES GET MISPLACED AND LOST. PEOPLE OFTEN PICK UP THE WRONG BAG BY MISTAKE; HOW CAN WE PREVENT THIS FROM HAPPENING, AND HOW CAN WE STOP THE BAGS FROM GETTING STOLEN WITH THE HELP OF A FINGERPRINT DETECTION SYSTEM?

-Neermitta

- **TO SOLVE THIS PROBLEM:**

*We need:*

- *A way to immediately recognize our suitcase*
- *A way to stop robbery at its initial stage*

- **IS THIS A REAL PROBLEM?**

- *there is 1.4 million lost luggage every year. Twenty-one million five hundred sixty thousand checked bags are not returned in due time to their owners.*
- *Checking in baggage on your flight is always hit-or-miss, with baggage loss a fairly common occurrence. Now there's solid proof, with a new survey finding that 35% of passengers have found their baggage damaged or missing in India.*
- *One in four fliers has been affected in the last three years, according to a survey conducted by Local Circles.*
- *Indian fliers' top three complaints continue to contain reports of missing and/or mishandled baggage.*

- **YES!**

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# Solution Chosen

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APPLYING FINGERPRINT SCANNERS ON THE TELESCOPIC HANDLES OF SUITCASES WOULD ALLOW USERS TO IMMEDIATELY DISTINGUISH THEIR LUGGAGE FROM AN EERILY SIMILAR ONE. IF THE FINGERPRINT DOESN'T MATCH, THE SOLENOID LOCK DOESN'T RETRACT, AND THE TELESCOPIC HANDLE DOESN'T WORK.

- *Background Research*

- *To reduce the amount of baggage lost, smart suitcases have been created. Pairing smart luggage with apps enables anti-theft and enhances proximity features, thus making travel secure and stress-free. Installed with a GPS chip, you can track it if it gets lost. The most brilliant luggage has smart locks with fingerprint scanners.*

- *These features do not reduce theft or mismatch cases.*

- *In cases of mismatch, we realize we've taken the wrong suitcase after quite a while(most commonly, after reaching home.)*
- *On the other hand, only after a theft has occurred do we use the trackers and other features to retrieve our suitcases.*

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# *Motivation*

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THE MAIN MOTIVATION BEHIND THIS PROBLEM STATEMENT COMES FROM A SOCIAL MEDIA POST. IT TALKS ABOUT HOW AIRPORT SECURITY IS INSANE UNTIL WE GET TO BAGGAGE CLAIM. AFTER THAT, ANYONE COULD GRAB A RANDOM SUITCASE AND LEAVE. THIS GOT US WONDERING... WHY SHOULD WE LET THIS HAPPEN? HOW COULD WE STOP THIS?

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## *Our Approach*

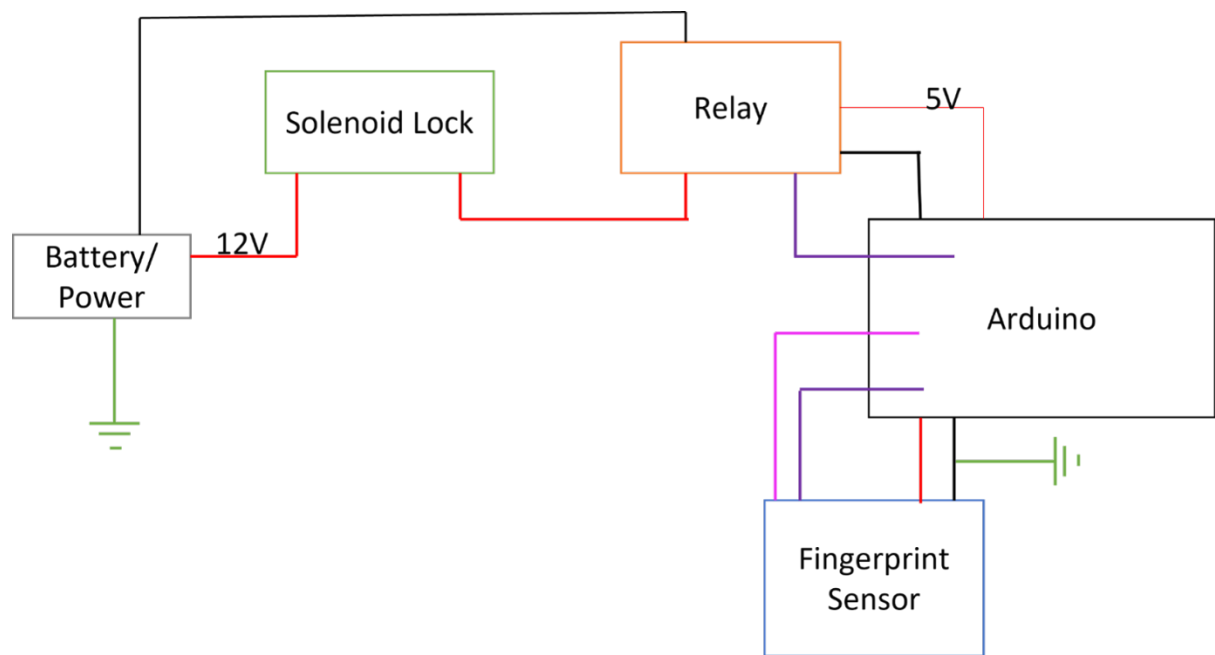
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WE STARTED BY MAKING A LIST OF ALL PARTS THAT WERE NEEDED TO MAKE THE SUITCASE; FOR THAT, WE CONSULTED DR. ARPIT KHANDELWAL, WHO EXPLAINED TO US THAT THE SOLENOID LOCK WE WERE USING WAS RATED AT 12 VOLTS, BUT ARDUINO CANNOT DIRECTLY GIVE ANY MORE THAN 5 VOLTS SO TO SOLVE THAT PROBLEM WE DECIDED TO USE A RELAY, WHICH WOULD ALLOW US TO CONNECT SOLENOID LOCK TO ANOTHER 12V POWER SOURCE CONTROLLED BY ARDUINO, FOR THAT 12 V POWER SOURCE WE USED 8 1.5V AA BATTERIES, THEN WE HAD TO SEARCH FOR A FINGERPRINT SENSOR, FOR THAT, WE HAD THE OPTION OF GETTING OPTICAL, ULTRASONIC OR CAPACITIVE FINGERPRINT SENSOR, THE CAPACITIVE SENSOR WOULD HAVE INTEGRATED BETTER WITH OUR DESIGN, BUT WE CHOOSE TO GO FOR OPTICAL FINGERPRINT SENSOR AS IT WAS CHEAPER, WE ALSO HAD TO SEARCH FOR A SUITCASE THAT HAD A TELESCOPIC HANDLE FROM THE INSIDE OF THE BAG SO THAT IT WOULD BE EASIER TO FIT THE CIRCUIT INSIDE THE BAG, AFTER TALKING TO SIR MULTIPLE TIMES WE WERE ABLE TO FINALIZE A LIST OF PARTS, THEN WE PROCEEDED TO ORDER THEM, WHILE WE WERE WAITING FOR ALL THE PARTS TO ARRIVE, WE TALKED TO DR ARPIT KHANDELWAL SO THAT THEY COULD TEACH US HOW TO USE A MICROCONTROLLER, SO TWO OF OUR GROUP MEMBERS WENT TO THE LAB WHERE SIR TAUGHT THEM HOW TO USE MICROCONTROLLER WITH A ULTRASONIC SENSOR EXPERIMENT, SO AFTER THAT BASED ON THE THINGS SIR HAD TAUGHT US WE STARTED DESIGNING CIRCUIT, IN WHICH WE CONNECTED THE 12 BATTERIES TO THE SOLENOID LOCK AND RAN THE CONNECTION THROUGH THE OPEN SIDE OF THE RELAY, AND WE CONNECTED THE RELAY SIGNAL PIN TO DIGITAL SIDE OF THE ARDUINO, POWER PIN TO 5V AND GROUND TO GND IN RELAY, THEN IN THE FINGERPRINT SENSOR THE PINS WERE A BIT DIFFERENT TO THE ONES WE SAW WHILE ORDERING WE HAD TO CONNECT 4 PINS TO ARDUINO BUT WE HAD 8 IN THE SENSOR SO THEN WE DID SOME RESEARCH AND FOUND THAT THE SENSOR USES UART COMMUNICATION PROTOCOL, SO THEN WE CHECKED EACH PIN SEPARATELY AN MARKED THE PINS WE WERE GOING TO USE 2 FOR SERIAL COMMUNICATION, AND 2 FOR POWER (GND AND 5V)

TO POWER THE ARDUINO, WE USED A 9 V BATTERY. AFTER THIS, WE PUSHED AN EXAMPLE CODE TO ENROLL OUR FINGERPRINT IN ARDUINO. SOME OF US ENROLLED OUR FINGERPRINTS; THE FINGERPRINT DATA IS STORED IN THE SENSOR. THE SENSOR HAS A MEMORY THAT CAN STORE UP TO 127 FINGERPRINTS. AFTER THAT, WE UPLOADED ANOTHER TEST CODE ON ARDUINO TO CHECK IF THE FINGERPRINT MATCHED, THEN WE STARTED MAKING THE CODE TO OPERATE THIS SUITCASE. WE USED THE ADAFRUIT FINGERPRINT LIBRARY AND THE AVAILABLE EXAMPLE CODES. THE LIBRARY HAD MANY VERY USEFUL FUNCTIONS. COMBINING SOME EXAMPLE CODES, WE MADE A CODE THAT CHECKED FOR A FINGERPRINT MATCH, AND IF THE FINGERPRINT MATCHED, IT TRIGGERED THE RELAY. THE CODE FOR THE RELAY WAS VERY BASIC, BUT WHILE TESTING, WE BROKE ONE OF THE RELAYS BECAUSE OF A WRONG CONNECTION. AFTER THAT, WE ALWAYS TOOK PRECAUTIONS.

AFTER ALL THIS, WE STARTED WORKING ON THE SUITCASE; WE FIGURED THAT WE WOULD FIRST NEED TO PUT A WOODEN PLANK INSIDE THE SUITCASE TO MOUNT THE WHOLE CIRCUIT ON, SO TWO OF OUR GROUP MEMBERS WENT TO A BASIC LAB WORKSHOP, WHERE THE LAB STAFF WAS ACCOMMODATING THEY TOLD US THAT WE HAD TO BRING THE PLANK THAT WE WANT TO PUT INSIDE OF OUR SUITCASE WHEN WE WERE SEARCHING FOR IT THE SIR SAID TO US THAT HE HAD ONE PLANK THAT WOULD EXACTLY FIT THE SUITCASE. HE GAVE US THE PLANK AND HELPED US FIT THAT IN. THEN WE PLANNED THAT WE WOULD HAVE TO DRILL A HOLE IN THE TELESCOPIC HANDLE TO HOLD THE SOLENOID LOCK IN THE HANDLE MECHANISM, THEN WE WENT TO THE LAB NEXT TIME. SIR HELPED US DRILL A HOLE IN THE HANDLE THEN WE ATTACHED THE SOLENOID LOCK TO THE WOODEN PLANK. AND THEN WE STUCK EVERYTHING ELSE TO THE PLANK. WE ALSO MADE A HOLE IN THE SUITCASE NEAR THE HANDLE TO THAT THE FINGERPRINT SENSOR COULD STICK OUT. THEN WE MADE THE FINAL CONNECTIONS AND CLOSED THE SUITCASE, AND IT WAS READY TO USE





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## *Individual Contribution*

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### *Aaditya (B22MT024):*

- I learned how to use Arduino from Arpit, sir
- I talked with Arpit sir to finalize all the parts.
- Made the circuit diagram after vigorously researching the internet for a few hours.
- Figured out how to use the fingerprint sensor, as the one we received differed slightly from the one we saw while ordering the sensor.
- Gave the idea to use 8 1.5V cells for the power source.
- Gave the idea to use relay and solenoid lock.
- Made the physical circuit.
- Helped combine two codes to make the third one.
- Collected permissions to work in the workshop.
- Helped in the workshop to make the base of the suitcase and also to mount the circuit.
- Gave the idea to mount the circuit on a wooden plank and drill a hole in the suitcase
- Learned how to do soldering and soldered wires.

### *Neermitta (B22BB028):*

- Contacted Arani Sir.
- Provided the final problem statement.
- Worked on most of the emails.
- Distributed the work in the group.
- Learnt Arduino from Arpit Sir.
- Helped in making the initial physical circuit.
- Did some of the simulations.
- Helped in making the code more efficient.
- Worked on the research.

### *Harish(B22EE029):*

- Helped in writing the code for the relay.
- Studied relay intensely, helping with all relay related connections.
- Helped in soldering the wires.
- Studied the specification of each and every component.
- Helped in simulation of the circuit.
- Also helped in writing the final code.
- Keeper to the things.

*Prince(B22CI031):*

- Helped mainly with the mechanical part of the project
- Went to search for the wooden plank
- Helped make the holes in the suitcase to fit fingerprint sensor
- Learned how to drill and helped with it
- Helped fit the components tight in the place

*Aiswarya(B22CS028):*

- Helped in doing the research on everything
- Helped in the lab with assembling everything
- Helped fill all the forms.
- Procured all the components
- Also helped with writing the Arduino code.
- Helped in the presentations.

*Khushi(B22AI026):*

- Helped with making all the presentations.
- Helped to understand how the whole circuit works.
- Helped finalize all the parts
- Helped in retrieving all the parts
- Attended the Arduino sessions and worked on the final circuit.
- Collected the reimbursement forms.

*Kanishk(B22ME029):*

- Helped to make the base and fix the components.
- Worked on the code for Arduino.
- Bought the materials required.