Automatic Denomination Identifier

Team iMoney

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IDEA AND MOTIVATION

- According to a National Program for Control of Blindness (NPCB) study, India currently has one-third of the world's blind population. The country has around 12 million people with vision impairment, compared to a global total of 39 million. Notes having the same denomination but various sizes, as well as no obvious identification on these notes, can dupe or exploit blind persons.
- In supermarkets people spend a lot of time counting money which makes wastes the valuable time of people around them.
- To tackle such issues, we desired a solution for a large audience, therefore we created an Automatic Denomination Identifier (ADI), which is a device that detects the denomination of the note and provides audio output.

LITERATURE REVIEW

Our team went through numerous product patents similar to our idea for the inspiration of this device. This includes Drishti[1], iBill[2]

OUR CONTRIBUTION:

- Making a portable machine that automatically identifies the denomination of the note, making it easier for visually impaired people to make transactions.
- The machine works for multiple notes at once, not just one note at a time.
- It allows people to count money faster and more accurately, making them free from the hassle of spending a lot of time counting money in supermarkets.
- This machine replaces those bulky counting machines and creates a portable alternative

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[1] https://www.jamesdysonaward.org/en-IN/2020/project/drishti/

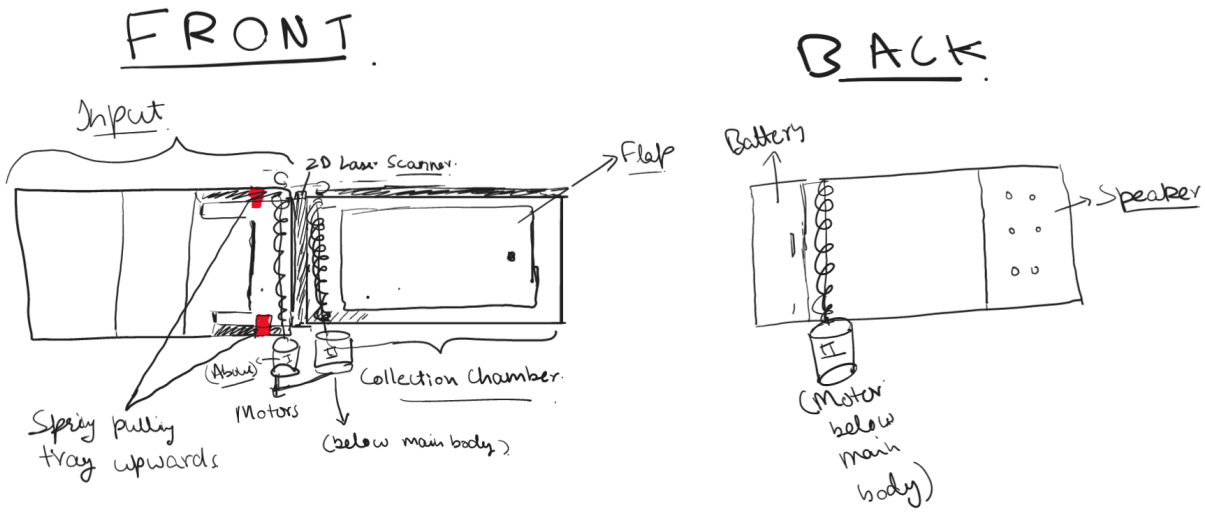
[2] The Free iBill Money Identifier from the US Bureau of Engraving and Printing | American Foundation for the Blind | AccessWorld | (afb.org)

SPECIFICATIONS

Hardware

Our project is divided into three main sections:

- **INPUT**
  - The input tray will comprise a backplate with a spring attached to push the bottom tray upwards.
  - On the upward flap of the input tray, will lie a DC motor with a textured rod attached to it, responsible for passing one note at a time through the sensor.
  - The input tray would be retractable to keep the design portable and easy to carry
- **PROCESSING**
  - A 2d laser scanner will measure the dimensions of the note, while the note is being moved from the input area to the collection area.
- **OUTPUT**
  - The other end of the sensor will have another motor with a textured rod. This motor will pull the note out of the sensor and put it in the collection chamber.
  - The top of the collection chamber will have a flap that can be opened and closed in order to take out the money.
  - Below, the collection system would be the speaker responsible for giving an audio output on the amount of money inputted into the device



Software

- A 2d laser scanner will be used to measure the dimensions of the note, while the note is being moved from the input area to the collection area. Adjusting for the motor's speed and the time duration for which the note was intercepting the laser beam, it'll give us the dimensions of the note.
- The data is sent to Raspberry pi, where further processing takes place.
- The dimensions then will be compared to the dimensions stored in the database, giving us the denomination of the note.
- The dimensions will keep getting added, resulting in the total amount of money, which will be later
- C++ can be used as the programming language, due to its less memory storage and lower runtime.
- The whole device will just have one button, making it easier for people to use the device.

Research

Dimensions of different denominations of the Indian currency, with no two denominations having the same dimensions:

Rs. 10: 123mm X 63mm
Rs. 10 (old): 137 X 63

Rs. 20: 129 mm X 63 mm
Rs.20 (old): 147 X 63

Rs. 50: 135mm X 66mm
Rs.50 (old): 147 X 73

Rs. 100: 142 mm X 66 mm
Rs.100 (old): 157 X 73

Rs. 200: 146mm X 66mm

Rs. 500: 150mm X 66mm
Rs. 2000: 166mm X 66mm

This proves that the concept of using dimensions to check dominations works.

IMPLEMENTATION STRATEGY

We've assigned some macro tasks for each one of us. Each one of us will be responsible for the development of:

- **Abhyuday:**
    - 3D CAD design of hardware components
    - 3D printing hardware components
    - Wiring all components together
- **Amey:**
    - Coding the software
    - Deploying on raspberry-pi
    - Testing and debugging
- **Sarthak:**
    - Attaching and configuring the motors
    - Combining all the hardware components
    - Adjusting the 2d laser scanner calculations and attaching it to the hardware components

Here are the day wise tasks:

Day 1:

- **Abhyuday:**
  - 3D CAD design
- **Amey:**
  - Coding software
- **Sarthak:**
  - Configuring motors

Day 2:

- **Abhyuday:**
  - 3D CAD printing of hardware components
- **Amey:**
  - Deploying on Raspberry Pi
- **Sarthak:**
  - Adjusting the 2d laser scanner calculations and attaching it to the hardware components

Day 3:

- **Abhyuday:**
  - Wiring all the components together
- **Amey:**
  - Testing and debugging
- **Sarthak**
  - Combining all hardware components