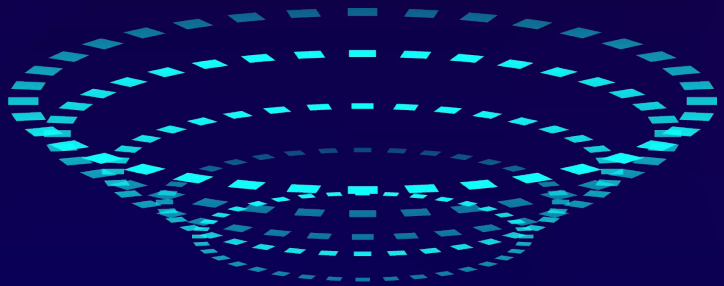
Group-III



Hyperion

Walks on High

- Under the guidance of Dr.Rakesh Kumar

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01 INTRODUCTION

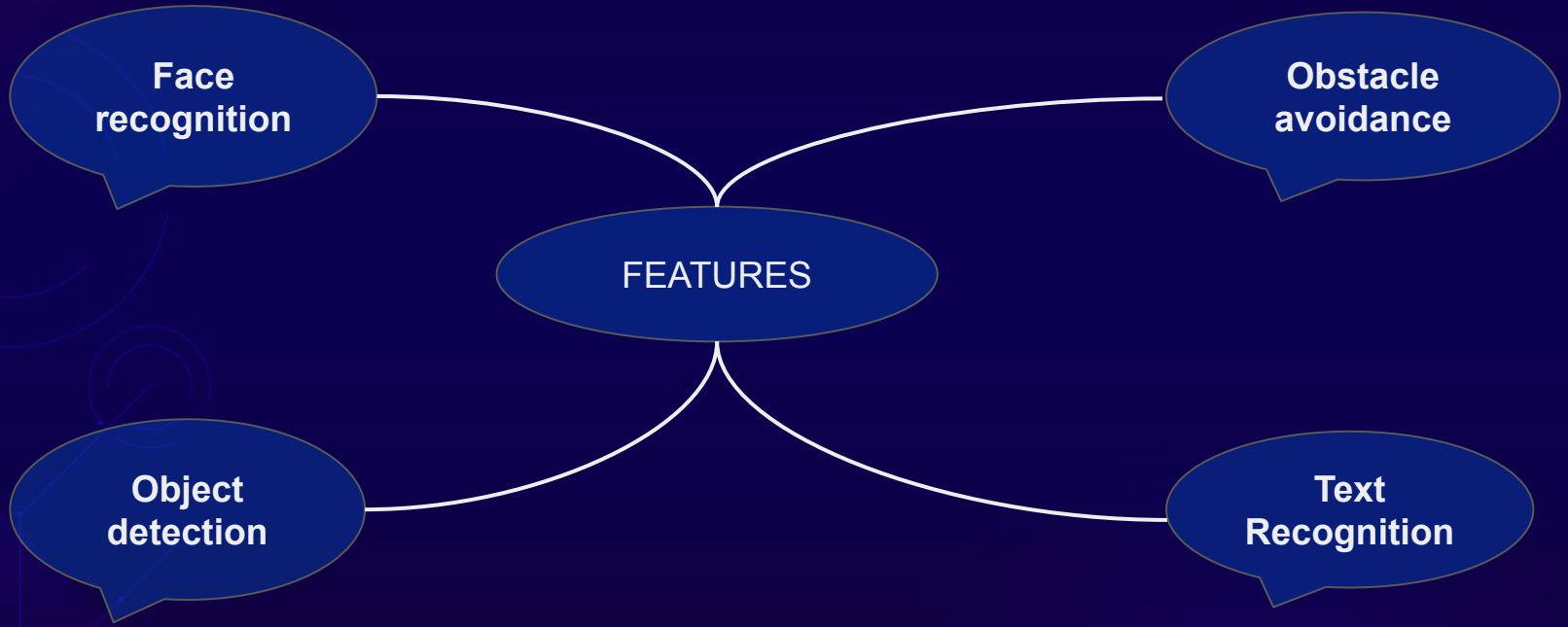
Robotics is one of the leading technologies in the world. Usage of robots has brought myriad remarkable changes in various sectors. Healthcare is one such sector where the robots are effectively being used. Blindness is a disability that affects millions of people worldwide, hindering their ability to navigate independently in their daily lives. So here we are with an assistive robot called “Hyperion” which helps in finding the path for blind.

02 Motivation

What motivated us?

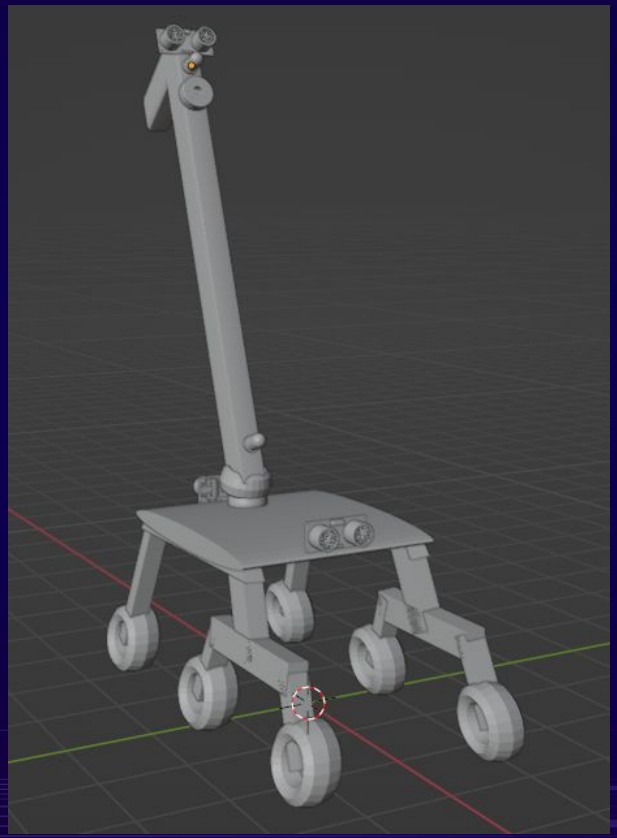
Imagine walking blindfolded around your room. A sense of vulnerability catches you up albeit being in a familiar place. Then imagine the situation of blind where they have to walkthrough umpteen places which are unfamiliar to them. Horrible right? This constant thought has motivated us to come up with this robot.

03 Model Prototype

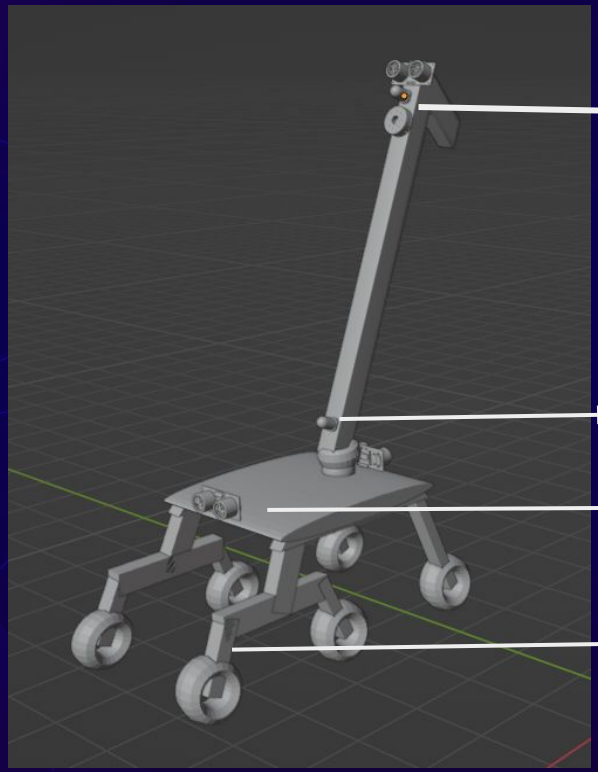


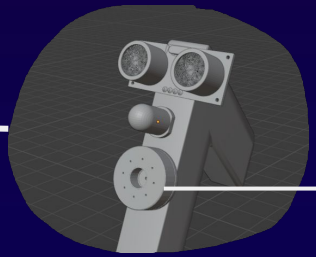
Model Prototype

Hybrid Suspension legs:
We plan to adopt a hybrid suspension model(combination of wheels and legs) in order to make it easy for the hyperion to move on uneven surfaces.



BLUEPRINT





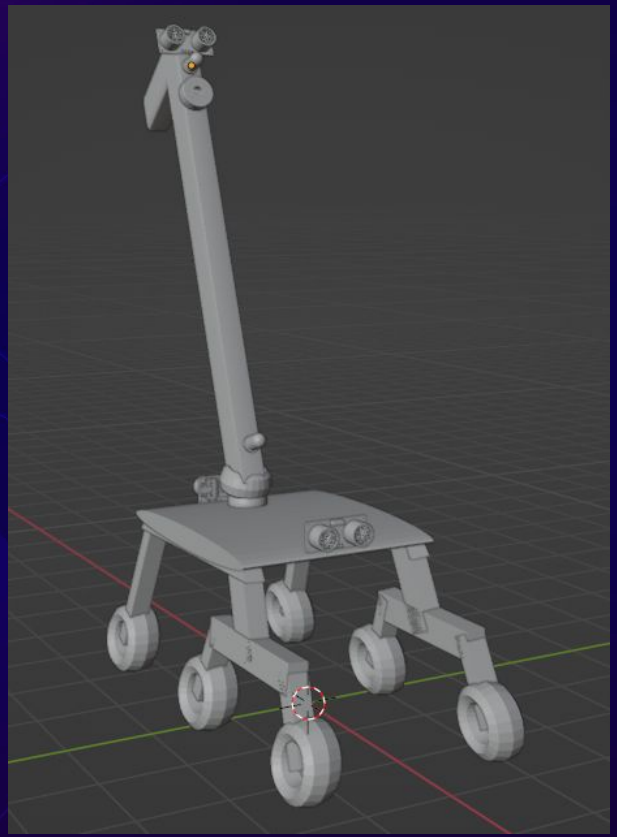
Night vision camera

LED(LDR Sensor)

UltraSonic Sensor

Hybrid Suspension leg

Multi-use Smart Stick



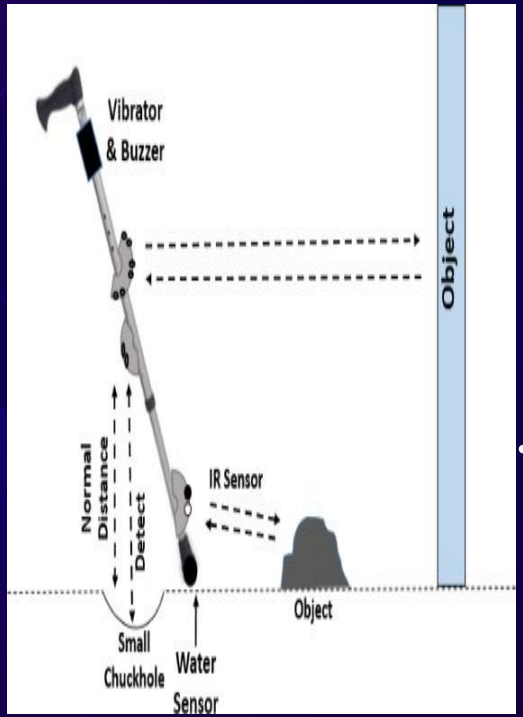
Hybrid Smart Stick:-

Our smart stick isn't just a guide to the user but a helper too. Whenever the user wishes to pick any object around him the stick acts as a **manipulator** with the **end effector** holding the object. Various kinds of joints are fixed in a way such that the user can lift the objects with the stick with minimal effort. It is quite evident that in the ordinary smart stick mode,the manipulator attains singularity i.e. it's degree of freedom is one.

04 Methodology

The robot will utilize a combination of sensors and technologies, including ultrasonic, night vision camera to detect obstacles in the environment.(Combination of) The robot will also have a speech synthesis to provide the user with information about their surroundings.

Hyperion Model

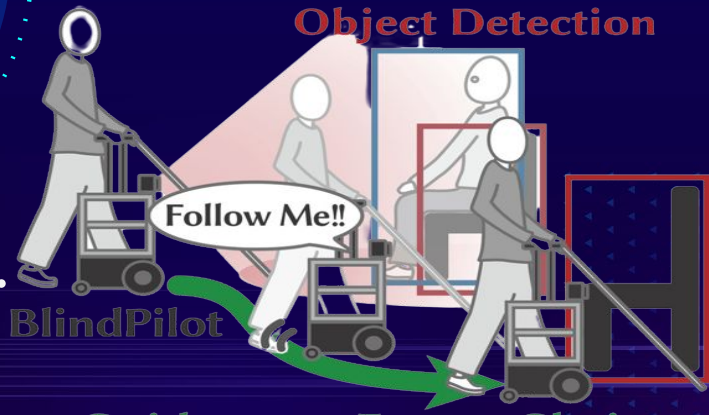


Tracking mobile application:

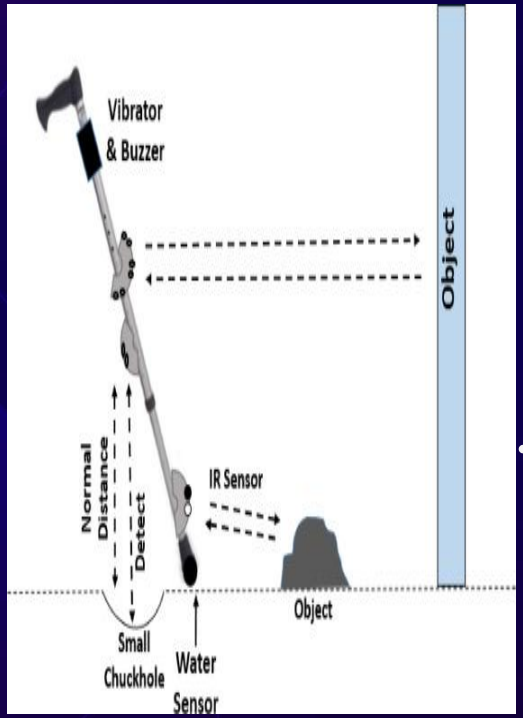
Used to help the specially-abled person's family for emergency response and also voice assistant for person

Object Detection:

Object detection and recognition, obstacle detection, face recognition, Text-recognition, Auto Path-Finder.



Hyperion Model



Face Recognition:

Identification of frequently communicated people and also recognizes most of the objects

Text Recognition:

Our Approach

Obstacle Avoidance:

Main components: Arduino board, servo motor, ultrasonic sensor

Implementation:

An ultrasonic sensor is connected to an Arduino board where the code for obstacle avoidance is dumped. Further a motor driver (which helps in changing the direction of robot based on the inputs given) is interfaced between the Arduino and the motors of our 4-wheeled robot. The ultrasonic sensor is fitted on a servo motor so that it can cover an area spanning 180°. Whenever the ultrasonic sensor detects an object within specified distance the robot changes it's direction there by taking optimal path avoiding any possible obstacles.

Our Approach

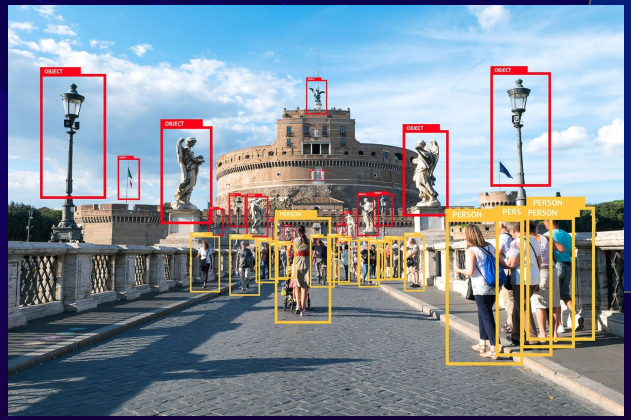
Stair case detection:

Main components: Raspberry Pi,night vision camera, bluetooth speaker

Implementation:

The night vision camera mounted at the edge of the stick can also be used for staircase detection. The process involves using a camera to capture an image of the surroundings and then applying convolution networks, such as the StairNet architecture, to detect stairs by analyzing the horizontal and vertical edges present in the image.

Our Approach



Face Recognition:

Main components: Arduino board, Raspberry Pi, Night vision camera, IDR Sensor

Implementation:

A Night vision camera is mounted at the one end of smart stick and images are matched with frequent faces in the database to get their details. We use a specific algorithm(**CNN+ BiLSTM with attention mechanism**) for face recognition. Whenever a person appears the deep learning model tries to identify them by scrutinizing database. And also this model recognizes various objects and sends the prediction to the blind person via Voice Command by bluetooth.

Our Approach

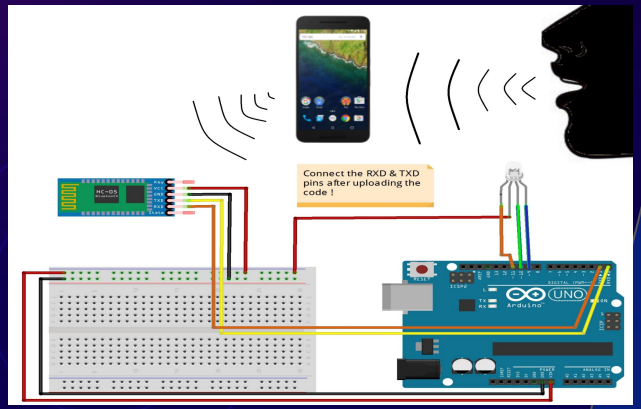
Text Recognition:

Main components: Arduino board, night vision camera

Implementation:

It is done in two stages. In the first stage, an **image-based encoder** extracts visual features from the input image, and a **character-based encoder** generates character embeddings from the recognized text. The two encoders are then combined using a novel attention mechanism to generate a **joint image-character feature** representation. In the second stage, a word-based decoder generates the final text output based on the joint image-character feature representation. The decoder is a Transformer-based model that uses both the visual and text-based features to generate the output text.

Our Approach



Voice Command by Bluetooth:

Main components: Arduino board, HC05 Bluetooth Module

Implementation:

Voice commands via bluetooth:-

A **HC05 bluetooth** module is connected to the Arduino board of our smart stick. Via this bluetooth module the commands are sent to the specially designed app (which the user installs in his/her mobile) where the text is converted to speech there by providing necessary guidance to the user.

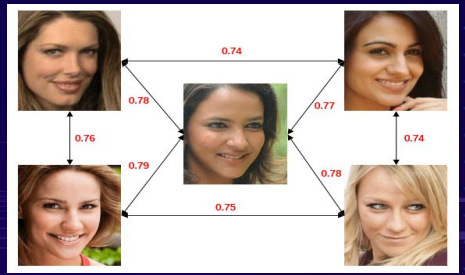
Face recognition, Text recognition, Object recognition Techniques integrates with the bluetooth module and helps the blind person to navigate easily.

CHALLENGES AND LIMITATIONS

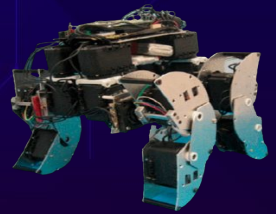
PATH DETECTION IN CROWDED PLACES

WATER SENSITIVE

LESS ACCURACY FOR FACE DETECTION



Weight of robot



Plan Of Action

Phase - I

1. Smart Stick to the Blind person.
2. Object detection, obstacle avoidance
3. 20 % completion of the Robotic system.

Phase - II

1. Smart Stick and Hybrid Suspension robot integration.
2. Object recognition, face recognition and text recognition
3. Voice Command by bluetooth
4. 50 % completion of the Robotic system.

Phase - III

1. Converting normal wheels into hybrid suspension legs for stair climbing and spinning gait.
2. GPS Tracking, staircase detection and Climbing
3. 100 % completion of the Robotic system.

CONCLUSIÓN

To sum up, our Pathfinding Robot HYPERION is a game-changing tool designed to empower blind individuals and enhance their mobility and independence. With its innovative technology, user-friendly navigation system, and exceptional capabilities, it has the potential to greatly improve the lives of those with visual impairments.

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