BLIND ASSISTING BOT

Description

The project idea that our group has decided on is a blind assistance bot. The idea is to modify a regular walking stick to enhance functioning and help a blind person more effectively. The stick will be attached with sensors and cameras to investigate the surroundings, motors and wheels for the bot's movement, and the bot will send audio signals to the person to correctly guide them. The bot will have two modes-

Automatic, in which the bot will guide the person.

Manual, In which some third person controls the bot and guides the person using the camera.

Motivation

The gift of vision is one of our most precious gifts. It helps us to perceive our surroundings in the best way possible. But not everyone is fortunate to have it. Without the ability of vision, we have seen blind people finding it difficult to walk or move around like ourselves. We have seen the blind man moving with a walking stick or a guide dog to help them walk. Training a dog to assist the blind and walking stick are not always efficient options. What we have come up with is a solution to this problem. We plan to build a blind assisting robot which will enable the movement of blind people effortlessly.

Functioning and Use

The bot consists of the following subsystems:

- The locomotion system-It consists of 2 wheels connected to 2 motors. This part of the system is responsible for the movement of the bot and guiding the blind man.
- The sensory system-It consists of a set of ultrasonic sensors and a camera. It is responsible for perceiving the environment and passing the information into the control system.
- The control system-It consists of a Raspberry pie unit which controls and integrates all other subsystems.

- The stimulus generating system-It consists of an audio system. It sends an audio trigger to the blind person according to the data got from the sensory system.

Automatic mode of operation

The ultrasonic sensors on the bot collect data regarding the environment. It works like a SONAR to check for obstacles in the path the person is moving. When it detects an object in front of it, It sends a signal to the controlling unit of the bot.

Now the controlling unit of the bot does two things when it detects an obstacle in the path. It makes the locomotion system point in an alternate direction without barriers. It also sends an audio stimulus to the person regarding the block ahead and the need to take a deviation.

Manual mode of operation

In the manual mode of operation, the camera will send a live telecasting to a 3rd person who can control the bot from a remote place. The 3rd person can help the blind person move effectively by controlling the direction of the bot. The user can control the bot's speed as per their walking speed.

Hardware Components

The major hardware components used for building the bot will be :

1. Raspberry Pie
2. DC motors and wheels
3. Ultrasonic sensors
4. Camera along with transmitter module
5. Audio system (like a headset)
6. Blindman’s stick
7. Lithium-ion batteries
8. Jumper wires

Software Requirements

We would be using the Raspberry pie as a controlling centre for the bot , hence would be mainly programming the bot in python environment. In future, with an objective to improvise the current design to an upgraded

version using computer vision, we may use specific libraries for programming like OpenCV.

Building Process

We first plan to build the locomotion part of the system, which includes attaching the servos and the wheels and integrating it into the tip of the blind man's stick. Then we will install the ultrasonic sensor and the camera onto the stick. Then we will connect all these mechanisms to a Raspberry Pi using wires and program it to do their functions. After that we plan to integrate the audio system into it. We plan to finish the basic model by the end of December 2022 or the start of January 2023.

Future Scopes

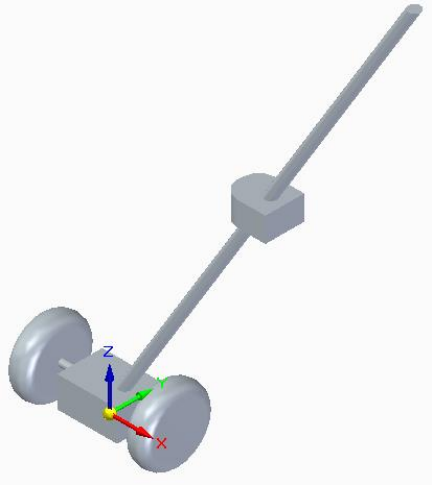
We could integrate image processing and machine learning into it to improve the project by adding functionalities like facial recognition and person following, identification of different objects etc. The user could be given a better experience by inculcating NLP (Natural Language Processing). This would also help in improving the user's knowledge about the outside world and can act similar to a third person guiding the user. We could also extend the bot to connect to a smartphone so that the user can get feedback on his phone from the bot along with using other utilities like Google Maps. Also, in the advanced versions, instead of using the raspberry pie as a computer for the bot, we could integrate the user's phone into the system, thereby using the phone's hardware (quite fast and efficient) to enable better efficiency and speed.

Output

The project is built keeping in mind the hardships faced by the blind when they move from place to place. It is built as a viable replacement for the traditional walking sticks and enables their walking to be smoother and guides them more efficiently.

By the completion of the project, we would be able to build a usable model of a smart walking stick for the blind. It will be making their movement from place to place more comfortable.

The approximate cost for the project is around Rs-12000 to Rs-13000. And the final model can be picturized as shown.



Resources

https://hai.stanford.edu/news/stanford-researchers-build-400-self-navigating-smart-cane

https://nevonprojects.com/ultrasonic-blind-stick-with-gps-tracking/

https://howtomechatronics.com/tutorials/arduino/ultrasonic-sensor-hc-sr04/