Different methods of obstacle detection:

LiDAR , Cameras and Ultrasonic.

LiDAR(Active):

Captures points depending it is 3d or 2d. It takes longer to process the information as the data collected is large. It emits short pulse of lights and a sensor receives it to measure the distance.

Cameras(Passive):

Multiple cameras are used to create a 3D image. It doesn’t use light like LiDAR. It needs to be calibrated which is difficult. We can use cameras in a binocular or trinocular configuration. Both cameras take a picture and then they compare blocks of pixels, individual pixel in hard due to high image precision. Infrared, Depth sensing cameras

Ultrasonic Sensors (Active):

Transmits and receives ultrasonic pulses to determine distance. They can work in dust and smoke others struggle. Air Temperature and low accuracy requires us to put additional sensor for high performance and accuracy.

Infrared Sensors:

Similar to ultrasonic sensors. Faster response time and much smaller than ultrasonic sensors. Lesser range than ultrasonic. Sunlight is an interference for infrared light. Narrower field of view.

Economics:

10 pcs ultra sonic sensor 12.99£

LiDAR module for Arduino £69.88

We have select ultrasonic sensor for the project as it is very economical as well as we can get a variety of them according to our needs. Comparatively other modules can be heavier which makes the product it self heavier. We can use the ultrasonic sensor on the servo as well which enables the flexibility to design the product. We have a couple of choices available whose measurement angle is around 15, 45 and 60 degrees. But some sensors like DFRobot SEN0001 doesn’t state the measurement angle. But they do state that we can use a servo to rotate the sensor 0-180 degrees.

Other ultrasonic sensors we have are :

1. Parallax PING Ultrasonic Sensor: it is expensive which costs about £36.53
2. HC-SR04 Ultrasonic Sensor: it’s measurement angle is around 15 degrees. It is cheap costs around £10 for 5 sensors. Distance is almost the same around 500cm.
3. DFROBOT SEN0001 is expensive costs £13.45 doesn’t specify any measurement angle. Measurement distance is around 800cm.

Arduinos,they have published libraries to code from which makes the thing easy and more convenient. I don’t think we will need any additional power source to power the ultrasonic sensors as we can do that by connecting the sensors in parallel which will draw approximately 45mA in total which is not a lot.

List of components needed:

1. Arduino(undecided)
2. Ultrasonic Sensor
3. Buzzer/ Vibrating module.
4. Water Sensor

We can connect all of them in parallel. Which should be enough voltage. Arduino can supply 1A at 5V which is 5Watts of power. I think that theoretically should be enough to power all the components. Power source for Arduino can be a 9v lithium battery which can be rechargeable hence convenient but at the same time it is dangerous as well. We have an option which is alkaline batteries but they supply only 50mA which 0.05A. Recommened operational value is around 0.5A to 1A.

Ahmed Seddik in his paper has proposed a system which also detects puddles. But hasn’t justified if it covers the range of vision.

Second concern is, let’s suppose if I have the stick in my right hand, will the sensors be able to detect something on my left hand side. So the position of sensors is something which can make my project different.

So the initial plan is to have a stick which can detect obstacles at maximum range with minimum sensors. Sensors will primarly be ultrasonic and a water sensor.

It is decided that I will be going with the Arduino nano. It has 22 pins. 6 will be used by 3 ultrasonic pins and 1 analog pin for water sensor if needed. Then 2 digital pins can also be used for a vibration module.

The minimum pins needed will be 6+1+2 = 9, maximum used will in case we use 3 vibration module so 6+6+1=13. This should be enough but we will need an external power source to power all the components. I AM DELAYING THE CURRENT CALCULATIONS AS I NEED TO DO OTHER STUFF/interim report. IT WILL BE CALCULATED WHEN I NEED TO DESIGN PCB.

I have finished the first draft of the design. The positions might be changed for the sensors after the prototype but theoretically they are practical and they might work.

I NEED TO REFER DESIGNS INSPIRATIONS. There’s also a thought to mount ultrasonic sensor on a servo but that will not be smooth in a sense that servos aren’t smooth in rotation and we need continuous rotation. Moreover they will make the stick heavy.

This will be answer to many questions.

<https://github.com/GaryDyr/HC-SR04-beam-tests>

Met with Ben on Thursday 09.11.2023. He suggested me to put in something which is like which tells the user that they have to turn right or left depending on the condition so the only way possible is through an audio which will be played when the corresponding ultrasonic sensor detects a device or an obstacle. So initial idea he gave was that I should use a Bluetooth module and then transmit over to the the Bluetooth earpiece in the ear but the issue with that is that the Bluetooth module which is compatible with arduino is only able to communicate serially so there's just one way communication. Which in result will make it impossible to pay the Bluetooth module with an earpiece as we have to pair the Bluetooth module with the earpiece, it could be done via a mobile phone but it will make the code much ineffecient. So another solution to that was to use a world hands free. Now the issue was that how can we play those intimidating messages to turn left or right. So I had to do a little bit of research which took me to text to speech modules, emic 2,ISd1820, ISD1932 module. So after all my research I conclude that there are some issues in which like some of these modules are discontinued and some of them just store one audio. Which makes them useless so I had to check for another thing which I could possibly use with the Arduino. So I came across DF mini MP3 player which is a module that can be connected with Arduino to play certain audios depending on the condition which can be hard coded. So the plan now is that I'll store the audios in the in the SD card and then depending on the conditions I'll play through the hands free. Now the issue is that the stuff available online if they have everyones has used speaker but I'll try making it through a hands freeze because I just need to do it separate connection .