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# Semi-Automatic Advanced Foldable Helmet

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# Semi-automatic Advanced foldable helmet

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**Abstract:** Today there is a monstrous fine for challenging the traffic standards in India. Individuals are likewise confronting different issues. The individuals who don't wear helmet get a colossal fine. Numerous individuals prefer not to wear head protector because of its substantial weight, heat and different parameters. To support wearing a protective cap, we structured this self-loader progressed foldable helmet. which is financially savvy, lighter in weight (microlattice[3] with PDMS[2]), and has different highlights, for example, cooling cushions, programmed wiper, foldable in nature, transparent OLED display, Bluetooth, GPS[4], night vision camera and edge recognition and our indigenously created voice colleague AI[5][6] For edge detection and AI we have utilized python programming language with OpenCV, speech recognition (pocket sphinx), pyttsx3, geopy, TensorFlow, Keras modules alongside message and phone calling API's. Its biggest advantage is its folding nature which means the overall helmet can be put inside a solitary shell with the assistance of separated fragments in it. The wearer doesn't need to open his protective cap by any means. During the rainy season, it's hard to drive, water beads jump on the glasses which make the vision hazy. To maintain a strategic distance from this issue, it contains an automatic wiping system. The helmet will automatically conceal the head with the assistance of downpour meter sensor and wiper will begin. There is regularly one issue identified with kids is that they nod off on the vehicle because of which mishaps occur. To maintain a strategic distance from such mishaps, a little piezoelectric buzzer is incorporated with an accelerometer so at whatever point they are at the skirt of nodding off the buzzer will ring up which will keep them awake. Similarly, during the night at times it's hard to drive, with the assistance of night vision camera put at both front and back, the driver can drive in obscurity and whenever required with the assistance of edge detection [3] he can figure out what the object is. Additionally, if a driver wants to navigate to a certain place, he doesn't need to investigate his telephone rather he can see the guide in the transparent OLED, which will help him in smooth and simple driving. The AI will assist the driver with various modes as and when required by the driver including messaging and calling.

Keywords: Microlattice, PDMS, TensorFlow, Keras, speech recognition, geopy, OpenCV, OLED transparent display

## Introduction

As we know there is a growing concern about innumerable traffic casualties. Everyday many people are charged with heavy fines just because they avoid wearing a helmet and sometimes they even meet with the accident. To avoid such fatalities we came up with an idea to design such kind of helmet which will provide leniency and also will let people carry it along with them. Moreover, it is a boost to the transportation sector.

With the increase in the technological sector, our helmet has several advance features which other smart helmet lacks. We have tried to integrate a strong Artificial intelligence with the help of Haar cascade classifier of OpenCV, TensorFlow framework, Keras. Speech recognition using pocket sphinx, locating the user with the help of geopy and other APIs. Apart from software aspects, for starting prototype we have used Arduino UNO microcontroller integrated with Raspberry Pi model 3 and along with an arducam for image and video processing. We are also using OLED transparent display for the easiness of the driver. One more feature that we felt that needs to be added specially for kids is that sometimes they nod off on two-wheelers due to which accidents occur. To prevent this, we have installed ADXL335 accelerometer along with small piezo buzzer that will ring up whenever the kid will start to nod off. In our helmet, we have also installed miniature glass wiper which will help the driver during the rainy season. This wiper will automatically start when water droplets will be tipped on it with the help of a rain meter sensor. The structural section is made up of micro lattice mixed with Polydimethylsiloxane (PDMS) and has been segmented so that it will merge to one shell.

## Workflow

The workflow has been divided into the main workflow and its subroutine.

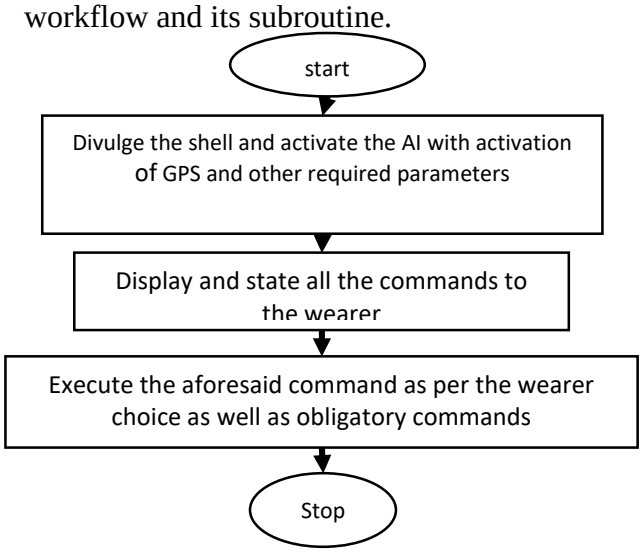


Fig.1. the main workflow of the overall process

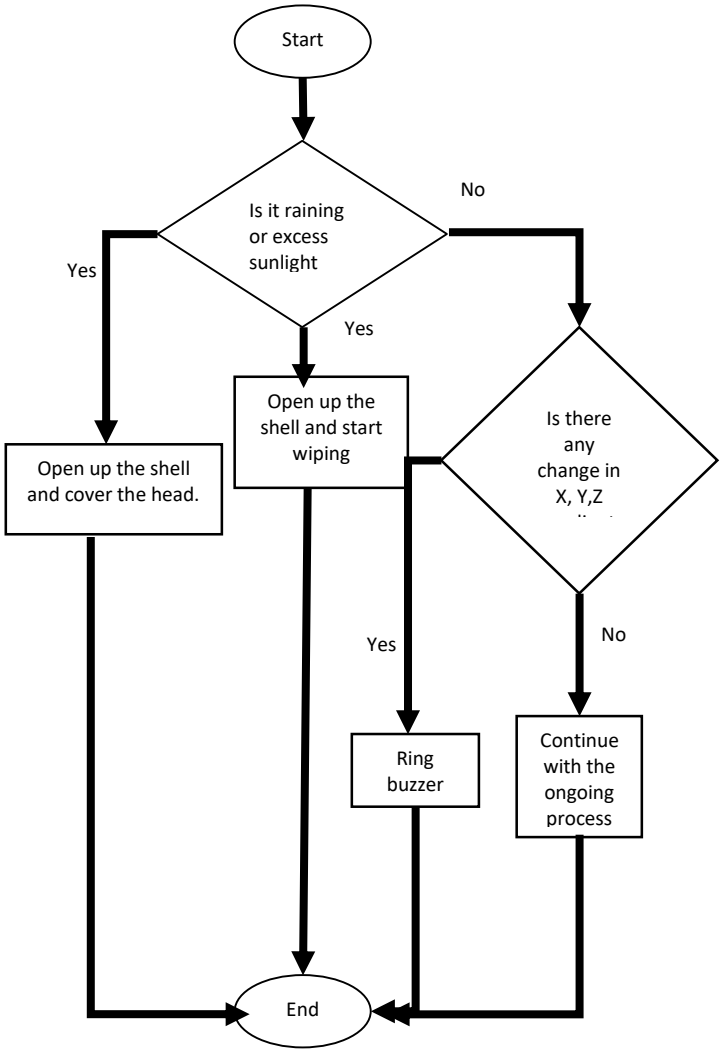


Fig.2. The figure for subroutine workflow

In the main workflow given above, it provides information about the overall procedure that has to be performed in the helmet. The second workflow that is for subroutine process it depicts how the operation of covering up the head takes place and also during downpour ho it will act according. Subsequently, the procedure for accelerometer has also been provided into the workflow process as these have been categorized inside secondary operations.

In the next segment, we will see how image processing is recognizing human figures and how it is detecting the edges of any object which will help the rider to travel during the night time without any difficulty.

We have used canny and haar cascade property of openCV for carrying out the overall process. Also, we have used several APIs for calling and messaging to another destination. Till now we have tried to integrate these properties with support vector machines and we are still in progress in working with deep learning library like TensorFlow and Keras for better precision

## Work was done

We have started working on our 1st prototype. As of now, we have built our helmet with minor elements. On the software aspect, we have worked on various features that have already been discussed in the previous sections. We are adding more features to our indigenously developed AI.

Fig.3. structure of the prototype

For image and video processing part we have calibrated our values to get more enhanced results. As mentioned we have used edge detection technique which is very much helpful during the night time. For this, we have used the canny property of OpenCV library to detect edges. We are still working with TensorFlow, Keras and masked R-CNN along with max-pooling and various activation function with different layers and weights for better optimization.


Fig.4. edge detection with the help of canny property

Subsequently, we have used Haarcascade method for face and body detection. During travelling one might need to detect various object at an instant for that we have taken help of yolo module which has a base of resNet architecture and also it is very much helpful and strong library for object detection.

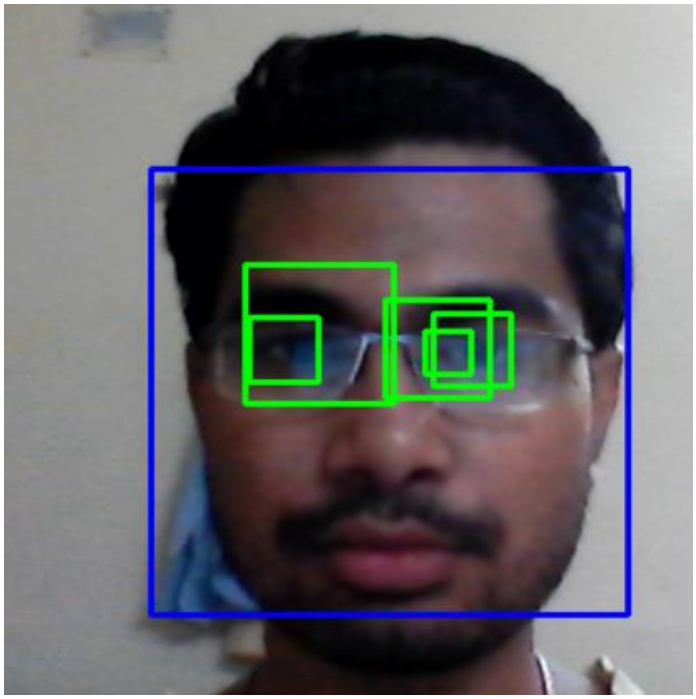

Fig.5. face and eye detection with haar cascade XML file

Subsequently for the message and calling API we have tried our procedure with the free trial and it worked well which again reduces extra component which can increase weight.

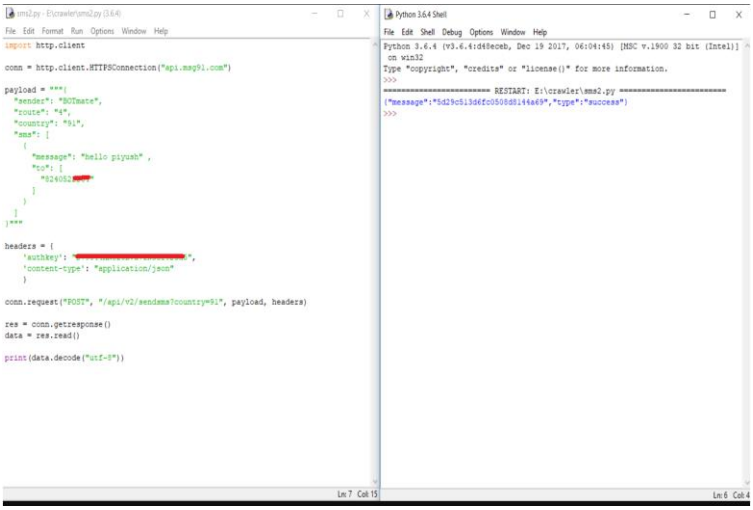


Fig.6. Message API for text messages

## Mathematical formulae

For our image recognition, we have used OpenCV to detect images since it contains 2 frames in a single-window we have to keep in mind about the intersection over union formulation which is given by **IoU = Area of overlap / Area of union.**

## Advantages

As mentioned before it will serve a lot to the general public. With more features like folding and automatic wiping method, more easiness will be provided. The biggest advantage of our helmet is that it is very much cost-effective, highly reliable and easy to use.

With the AI installed, it will act as a constant companion that the user can interact with. The visual display is transparent which again adds flexibility to see the inner view as well as the outer view.

We have tried to reduce the component without compromising the efficiency and number of features in it which pushes up our design to the next level.

For kids also it will act as a safety tool for them which will reduce the chances of accidents.

## Disadvantages

Its only disadvantage is its training time that is required to train the neurons in the neural network. Once done it will go a long way until a major bug has been found.

## Future scope

Since this is our 1$^{st}$ prototype we will try to remove the bugs that we can think off. With more advancement, more and more upgrades can be seen in accordance with the people demand.

Since it acts as a lifesaver for the people, we are trying to make our helmet worth it. During the upgradation phase, we will also work more on our AI to assist more precisely to the user.

## Conclusion

We know that with the growing demand for transportation sector people opt for those essentials that will make their life better and easy. Once this project is completed, people will get an easier version of what they call as heavy loads that they don't want to carry. It will serve a lot to humanity in the long run with our indigenously developed assistant.

## References


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