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# Smart Cap for Visually Impaired People

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**ABSTRACT:** Smart cap is an assistant for visually impaired that is design tonarrate the description of a scene through pictures via webcam. Thereare millions of visually impaired people in the world. They are not ableto experience the world which we people can. So our project Smartcap for visually impaired people will try to provide them the missingexperience of the beautiful world. The blind people who live in oursociety faces numerous problems like People walking on the street,Approaching of vehicles Uncertainty of the roads, Numerous obstaclepresent on the street.

**KEYWORDS**: face recognition, object detection, python, text recognition, CNN.

## I. INTRODUCTION

Our world is witnessing a growing occurrence of different disasterseither natural or manmade almost daily and no society can claim im-munity against disasters. Most countries have commenced focusingon their disaster management plan by emphasising disaster risk re-duction and enhancing the readiness of different organisations in NewZealand, according to the Civil Defense Emergency Management Act2002, the importance and emphasis on preparedness requirementsand plans are highlighted (Ministry of Civil Defence and EmergencyManagement, 2002; New Zealand Legislation, 2017). Nevertheless,it is believed that these plans will be more effective, if the requirements and demands of all citizens from different groups are considered and addressed. In the other words, the plan requires all-of-society engagement and partnerships (Duncan, Parkinson, Keech,2018). However, in most cases, there are some neglected communities like physically challenged people who require additional andoften special needs. People living with visual impairment are unableto experience the world the way people with normal eyesight do. Afundamental challenge faced by this group of people is the inabilityto navigate between locations effectively like people with normal eyesight would. In non-disaster situations, these people have access todifferent assistive technological aids and supporting services; how-ever, during disaster situations, these supporting devices and ser-vices may become either unavailable or inaccessible.Depending onthe disaster type and severity, the aftermath can disrupt differentinfrastructures and the fundamental services provided by governmentthat people rely on. This interruption can seriously impact the lives ofcitizens and people living with conditions. Furthermore, the situationis made even worse for physically challenged individuals. Accordingto the American Foundation for the Blind, this group of individualshas been identified as a vulnerable group that is highly impacted bythe influence of disasters (American Foundation for the Blind, 2016).The study discovered that Christchurch New Zealand's 2011 earth-quake and Japan's Honshu Island earthquake of 2016 affected people with visual impairment, and particularly the older adults. Today,many physically challenged individuals depend on assistive technologies to undertake their day-to-day activities. As a result, they willrequire additional support during and after disasters especially whenthe infrastructure and other services are unavailable. Different dis-aster management plans (Duncan et al., 2018; Ulmasova, Silcock,Schranz, 2009; World Health Organizations, 2011) have been put for-ward addressing groups with special requirements. Compared to thediversity of the problems and their population, this is still minimal(World Health Organization, 2017). The term 'disability' covers a widerange of disability forms; this study however, focuses on individualsliving with visual impairment. A World Health Organization (WHO) re-port states that there are 285 million people with visual impairmentworldwide. According to their statistics, of this group, 39 million arepartially blind and more than 1.3 million are completely blind. In mostindustrial countries, approximately 0.4 of the population is unsightedand in developing countries, it rises to 1 (World Health Organization,2017). Smart cap is an assistant for visually impaired that is designto narrate the description of a scene through pictures via webcam.There are millions of visually impaired people in the world. They arenot able to experience the world which we people can. So our project"Smart cap for visually impaired people" will try to provide them themissing experience of the beautiful world. The blind people who livein our society faces numerous problems like People walking on thestreet, Approaching of vehicles Uncertainty of the roads, Numerousobstacle present on the street.

## II. RELATED WORK

Rohilla, Yogesh Parihar, Vipul K Rohilla, Kusum. " Ultra-sonic Sensor based Smart Cap as Electronic Travel Aid forBlind People." 2020 [1].This paper aims to develop an ultrasonic sensor based smartcap prototype as an electronic travel aid for blind people that canhelp them travel independently. The smart cap consists of AT-mega microcontroller, Arduino board, three ultrasonic sensors,and a buzzer.

Vijitha, D. and Mrs. P. Pushparani. "A Smart Walking Assistance for Visually Impaired People – A Review." (2019)[2].This paper proposes an Arduino Nano based obstacle findingstick for visually impaired people, which helps a blind personby detecting the obstacles using Ultrasonic sensors and androidmobile application. It is able to inform the blind person aboutthe circumstances & present condition of the path where he/sheis walking.

Gaikwad, Arun G., and H. K. Waghmare. "Ultrasonic smartnode.cane indicating a safe free path to blind people." 2015.Human vision plays a vital role in awareness about surroundingenvironment.[3] The term visual impairment covers wide rangeand variety of 3 vision, from blindness and lack of usable sight;to low vision, which cannot be corrected to normal vision withstandard eyeglasses or contact lenses. Visually impaired toolscan assist them to enrich their lifestyle.

Oladayo, Olakanmi O.. "A Multidimensional Walking Aid forVisually Impaired Using Ultrasonic Sensors Network with VoiceGuidance." 2014[4].Science and technology always try to make human life easier.The people who are having complete blindness or low vision facesmany difficulties during their navigation. In this paper, we de-sign and implement a smart cap which helps the blind and thevisually impaired people to navigate freely by experiencing theirsurroundings.

Mahmud, Mohammad HazzazSaha, R Islam, Sayemul. (2013)[5].Smart walking stick-an electronic approach to assist visuallydisabled persons. International Journal of Scientific and Engineering Research.Visually impaired people face lot of difficulties in their daily life.Most of the times they depend on others for help. Several technologies for assistance of visually impaired people have been developed. Among the various technologies being utilized to assistthe blind, Computer Vision based solutions are emerging as oneof the most promising options due to their affordability and accessibility. The main objective of the proposed system is to cre-ate a wearable visual aid for visually impaired people in whichspeech commands are accepted from the user.

## III. PROPOSED ALGORITHM

A. *System Design:*

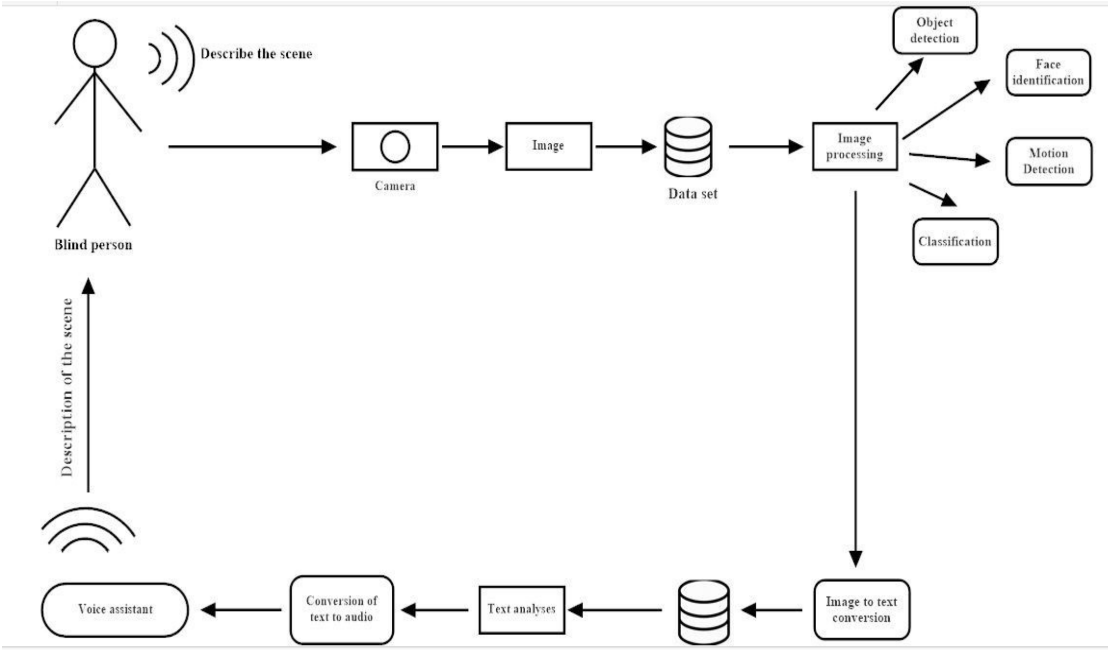


Fig 1: System Architecture

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B. *Modules:*

1) Image Acquisition
Image is acquired by Camera, The above mentioned process is doneon each image.
•Training Model The model is trained with images so that they areable to recognize objects, Text and faces later.
•Face, text and Object Recognition The model is tested to giveresults for face recognition, text recognition and Object Recognition
2) Relatives Module
Relative module has relative information.
•Adding the Relative Information
•Displaying the Relative Information

## IV. Pseudo code – CNN Encoder

- Step 1: Dataset containing images along with reference Dataset is fed into the system
- Step 2: The convolutional neural network is used a encoderwhich extracts image features 'f' pixel by pixel
- .Step 3: Matrix factorization is performed on the extracted pixels.The matrix is of m x n.
- Step 4: Max pooling is performed on this matrix where maximumvalue is selected and again fixed into matrix.
- Step 5: Normalization is performed where the every negativevalue is converted to zero.
- Step 6: To convert values to zero rectified linear units are usedwhere each value is filtered and negative value is set to zero.
- Step 7: The hidden layers take the input values from the visiblelayers and assign the weights after calculating maximum prob-ability.

## V. Application Results

A) Dashboard For Application

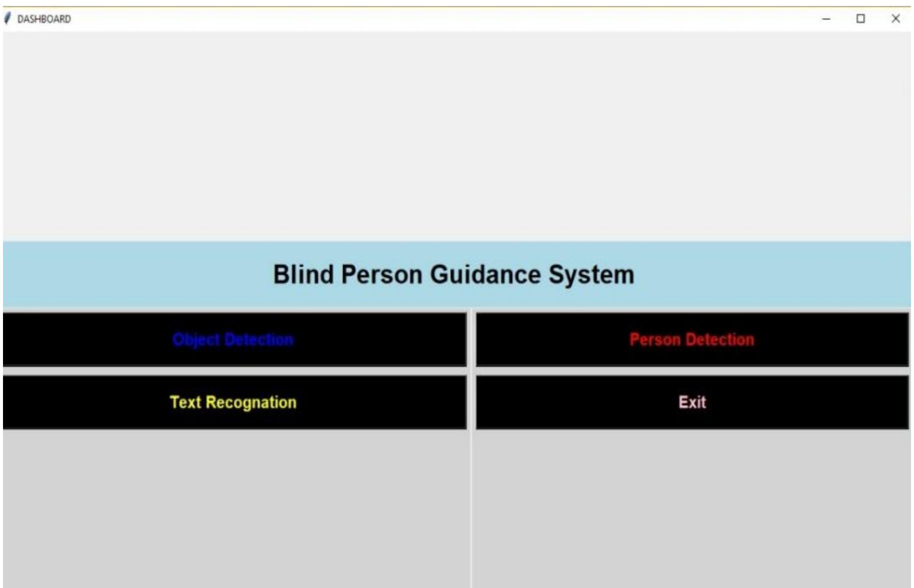


Fig 2: Application Dashboard

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B) Input for Object Detection

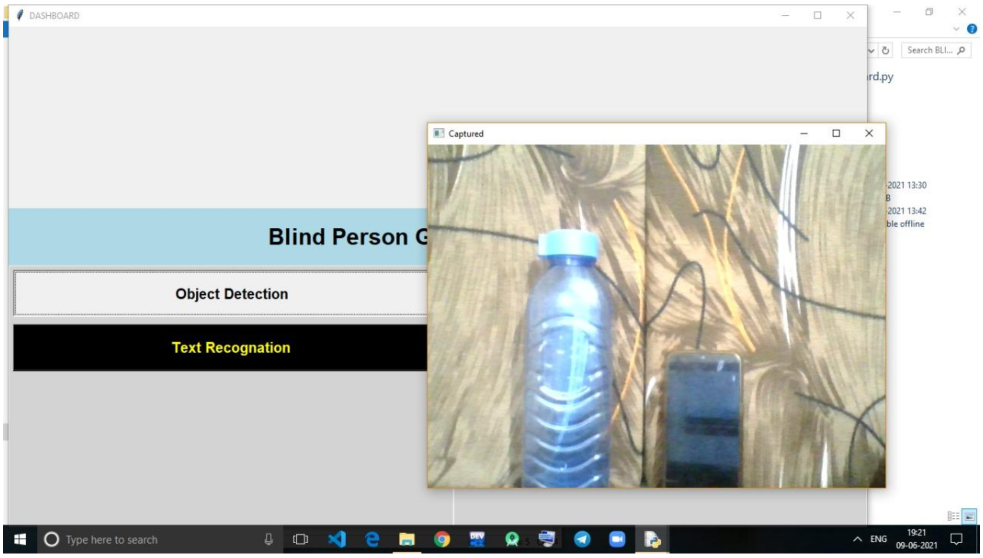


Fig 3: Input for Object Detection

C) Output for Object Detection

```
Python 3.6.8 (tags/v3.6.8:3c6b436a57, Dec 24 2018, 00:16:47) [MSC v.1916 64 bit (AMD64)]
Type "help", "copyright", "credits" or "license()" for more information.
>>>
==== RESTART: E:\js\BLIND_PERSON_TEXT_OBJECT_FACE_VOICE\user_dashboard.py ====
>>> saved
[39, 39, 39, 39, 67, 67, 67, 67]
[]
,bottle
[]
,bottle,cell phone
,bottle,cell phone
objects detected are bottle,cell phone
```

Fig 4: Output of Object Detection

D) Input For Face Detection

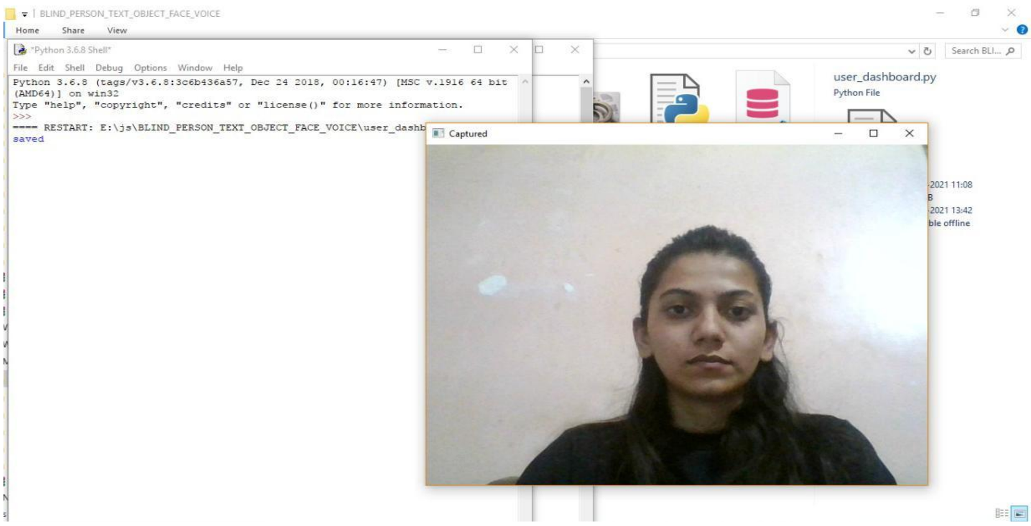


Fig 5: Input for Face Detection

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E) Output for Face Detection

```
*Python 3.6.8 Shell*
File  Edit  Shell  Debug  Options  Window  Help
Python 3.6.8 (tags/v3.6.8:3c6b436a57, Dec 24 2018, 00:16:47) [MSC v.1916 64 bit (AMD64)]
Type "help", "copyright", "credits" or "license()" for more information.
>>>
==== RESTART: E:\js\BLIND_PERSON_TEXT_OBJECT_FACE_VOICE\user_dashboard.py ====
saved
[0, 0, 0, 0, 0, 0, 0]
[]
,person
>>> Gita
Person Detected is Gita
```

Fig 6: Output For Face Detection

F) Input for Text Recognition


Fig 7: Input for Text Recognition

G) Output for Text Recognition

```
Python 3.6.8 (tags/v3.6.8:3c6b436a57, Dec 24 2018, 00:16:47) [MSC v.1916 64 bit (AMD64)]
Type "help", "copyright", "credits" or "license()" for more information.
>>>
==== RESTART: E:\js\BLIND_PERSON_TEXT_OBJECT_FACE_VOICE\user_dashboard.py ====
>>> saved
Do good
for others.
It will
come back
in unexpected

ways.

www.YourPositiveOasis.com
```

Fig 8: Output for Text Recognition

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H) Relative Dashboard

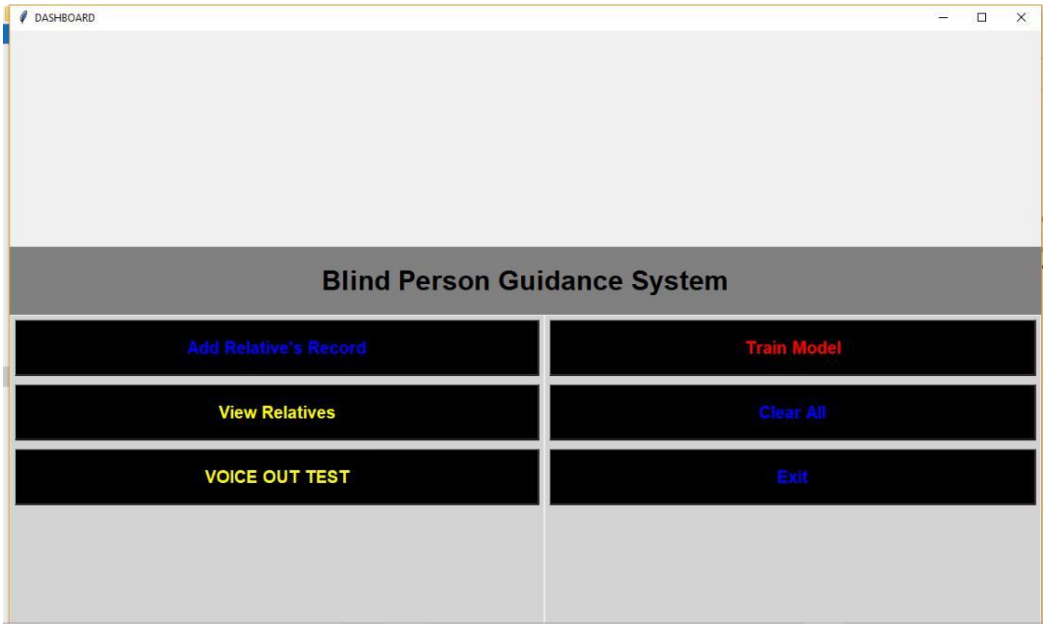


Fig 9: Relative Dashboard

I) Adding Relative Information

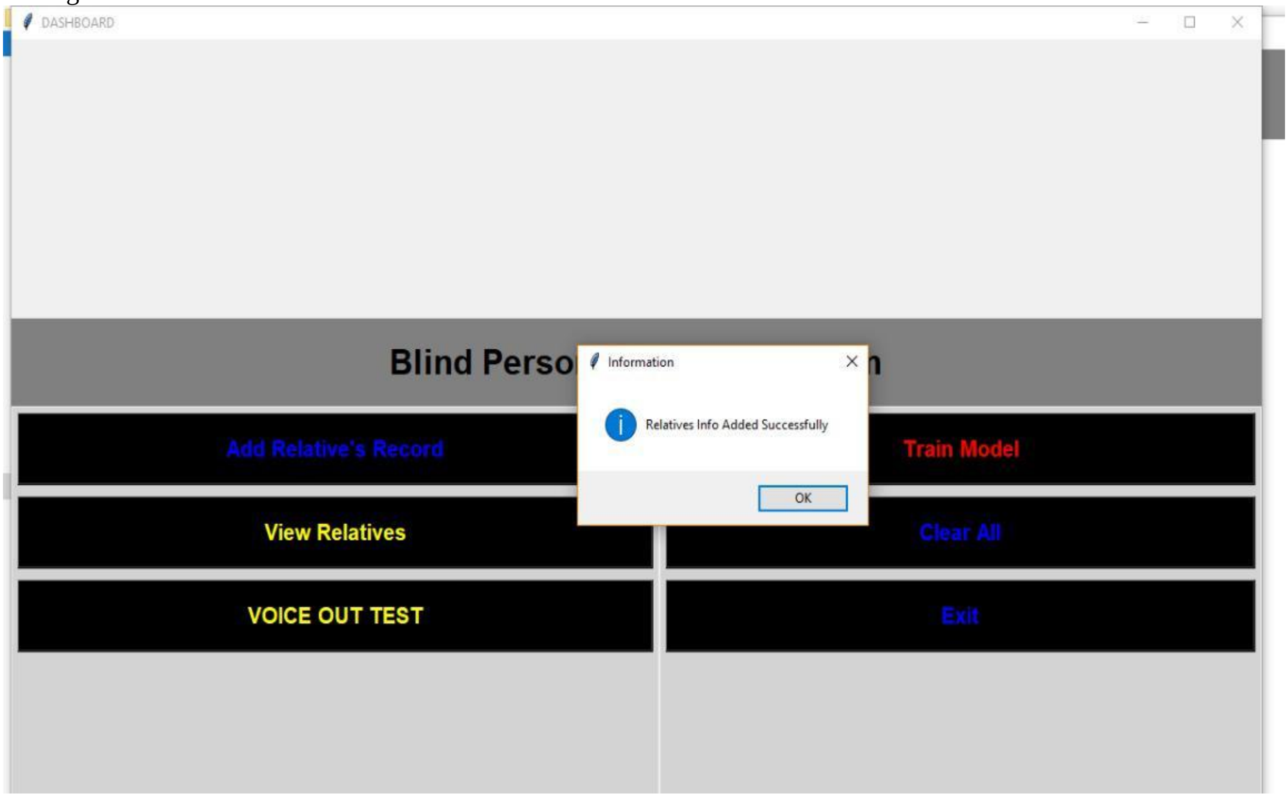


Fig 10: Adding Relative Information

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J) Details of Relatives Added

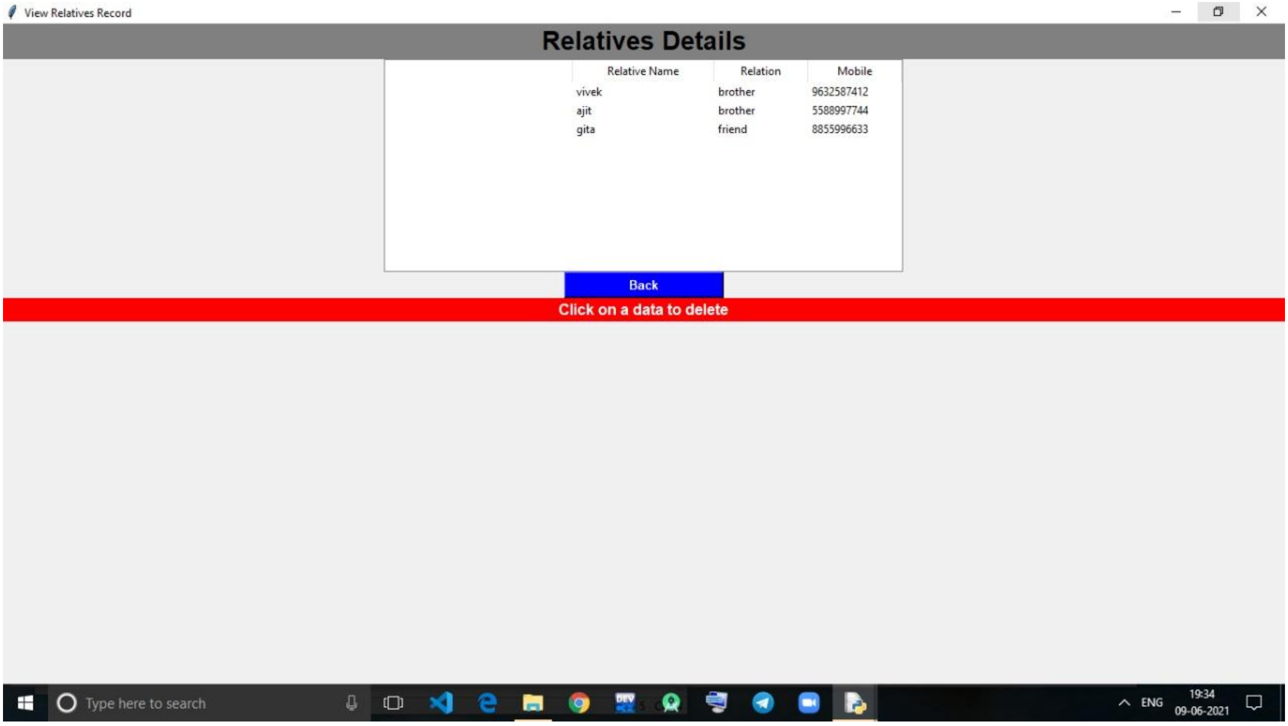


Fig 11: Relative Information

## VI. Conclusion and Future Work

Various research studies have investigated the challenges that disabled people, especially those with visual impairment face during and after disasters. Unfortunately,this group of individuals are constantly being excluded from disaster managementplans in different countries, and no specific supporting devices or services are provided for them during and after disaster situations. These people have been identifiedas a vulnerable group who may be affected dramatically by disasters. Besides theirloss of vision, their challenges also extend to mobility and communication difficultyin disaster scenarios. To address this challenge, this research study has proposed theSmart Cap solution that can be utilized by the visually impaired for normal activities,and especially during disaster situations. This Smart Cap device will provide a real-time navigation and narrative system. The device is cost effective ,which makes it affordable and accessible for the wider community who suffer from this problem. Wehope that this proposed Smart Cap can be a step to providing the visually-impairedpeople with the missing support and services they so desperately need during andafter disaster situations. This research work is only a proof-of-work; in our futurework, we hope to make a complete standalone version with additional assistive functionalities for the blind.

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