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Blind Smart- Smart Mobile App to Find Crosswalks for Visually Impaired

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Abstract

A new framework for crossover detection and localization is proposed. Proposed model extracts satellite pictures captured from Google Maps. To find crosswalks we use popular machine learning algorithm which uses images obtained from google application. Smart phone with GPS hold by visually impaired person is used to initialize the extraction of pictures from Google Maps, also to assist its user by providing audio feedback of the closest detected crossover. Proposed model provides better results for low resolution pictures also.Proposed model also suggests shortest path to reach destination with minimum number of cross walks.
IndexTerms–*Image Processing, Image Segmentation, Accessibility technologies*

INTRODUCTION

Usually blind people suffer when they move with public. Their transportation in daily life leads to horrible day for them. Many researchers proposed lot of solutions for navigation of people with vision impairment. Some of them are INS, GPS, Machine vision sensing etc.

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Even today many blind people using a device called White Cane. Using that device blind people can detect obstacles by scanning their surroundings. When blind people move to unfamiliar places this device helps them lot. After that due to technological advancements and the invention of IoT and smart devices many applications developed to support people with vision impairment.

Many of these applications collectively use GPS, the digital compass, camera, motion sensors to support blind people. The GPS receiver has been broadly used as one of the primary navigation sensors for providing a positioning solution. Correctness of this system depends on hardware, surrounded environment and efficiency of satellites. To improve performance of the system modern mobile phones use their AGPS facility. Further we can improve the efficiency of the system by WAAS corrections or by using hardware like differential GPS (DGPS) receiver. However, the GPS positioning solution is not reliable in if blind people use subway stations, indoors etc.

WHO REPORT

TOTAL VISUALLY CHALLENGED	POOR VISIBILITY	BLIND
285 MILLION	246 MILLION	39 MILLION

Visually impaired people can use devices like white cane, blind tracks etc. These devices have some disadvantages like need interference from public, weather etc.

However, even with these resources, transportation in outdoor environments presents a major challenge for them. Smart mobile devices help lot in supporting people with disabilities.

Using images captured by smart phones we can detect and localize cross walks. But still we have some disadvantages like positioning camera and difficulty in getting wide screen images etc. So we go for the other alternate method like micro phones and sensors to automatically perform image acquisition.

Using smart phones and GPS we can taking out images captured by satellites to locate and detect cross walks. By analyzing satellite images and image coordinates we can find the relation between cross walks and the user. These steps mainly eliminate the necessity of the user to point out the camera for image acquisition.

To locate nearer cross walks for the blind people we developed computer based model.

Steps:

1. Initially the user carries his mobile phone which gives GPS coordinates of his current location
2. Using Google map we can get low resolution images of cross walks and they are given as an input for finding crosswalks.
3. To detect crosswalks we can use any machine learning algorithm
4. Crosswalk detected is analysed with GPS coordinate for localization process.
5. Finally the proposed model guides the user regarding nearest cross walk using moble phone voice alert.

By applying these steps blind people can detect their nearest cross walk approximately 8 to 10 meters. We can use specialized hardware or GPS advanced technology to provide good results. Further to improve accuracy we can combine camera images captured by smart phones with already existing model.

EXISTING SYSTEM

1. Zebra Recognizer software library is used for Zebra Localizer application.
2. Using line segment detection and grouping algorithm, we can find crosswalks. Images captured from smart phones are used.

DISADVANTAGES OF EXISTING SYSTEM

1. Accuracy of system depends on user performance
2. Not good for low resolution images

PROPOSED SYSTEM

Proposed model alerts blind people about nearer cross walks with greater accuracy.

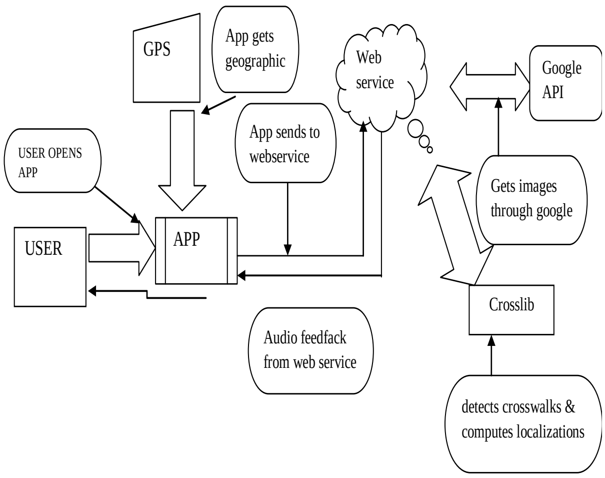
Steps:

1. Initially the user carries his mobile phone which gives GPS coordinates of his current location
2. Using Google map we can get low resolution images of cross walks and they are given as an input for finding crosswalks.
3. To detect crosswalks we can use any machine learning algorithm
4. Crosswalk detected is analysed with GPS coordinate for localization process.
5. Finally the proposed model guides the user regarding nearest cross walk using mobile phone voice alert.

ADVANTAGES OF PROPOSED SYSTEM

1.Cost effective
2. Good for low resolution images
3. The user intervention is minimal.
4. This ensures that after identifying the zebra crossing the user can also cross it when there is no traffic movement based on the voice feedback.

ARCHITECTURE



IMPLEMENTATION

The implementation is based on five different modules. They are
1. Path Initialization
2. Image processing
3. Crosswalk detection method
4. Crosswalk localization method
5. App feedback

Path Initialization

This module is used to suggest best path to follow by blind people to reach destination.

Steps:
1. User gives destination name
2. Dijikstra's algorithm is used to suggest path to follow by considering number of cross walks as metrics.
3. Smart phone alerts blind people regarding the available paths to reach destination and of course the best one too.

Algorithm:
1. Routing table is constructed with information like source place, destination place and number of cross walks in between source and destination.
2. User gives voice input of their destination.
3. Voice input is translated to text and by applying any shortest path algorithm nearest route is determined.
4. To find optimal route number of crosswalks blind people will face is considered as one of the metric other than distance.

Image Processing

Google map images are obtained.

Steps:

1. Image segmentation: Defines region of interest such that images includes cross walks.

2. False positives related with unrelated areas can be minimized or completely reduced using this step thereby we can improve computational performance.

3. Initially images captured from Satellites and mobile phone images are converted to gray scale.

4. By using threshold method region of interest is calculated.

5. The segmentation is obtained by applying threshold to each pixel (x, y) of R by λ.

$$B(x,y) = \begin{cases} 0, & if \ R(x,y) \leq \lambda \\ 1, & otherwise \end{cases} \quad (1)$$

6. Undesirable features are removed.

7. Final output image is generated with the help of image obtained form step 6 and original gray scale image

Crosswalk Detection Method

In this module we detect cross walks by classifying satellite images in to region of interest. For this the image is portioned as small cells usually with a size 15 in normal. Each 4 neighboring cells are grouped. Each group consists of reference call and other adjacent cells. When we apply classification method all cells which are classified as interested cells are visited.

We normally do another verification once we decide the reference square as a cross walk. During this phase we group eight neighboring squares nearby the reference region. Either the reference patch is accepted or rejected after performing some analysis.

Crosswalk Localization Method

To localize cross walks,

Steps:

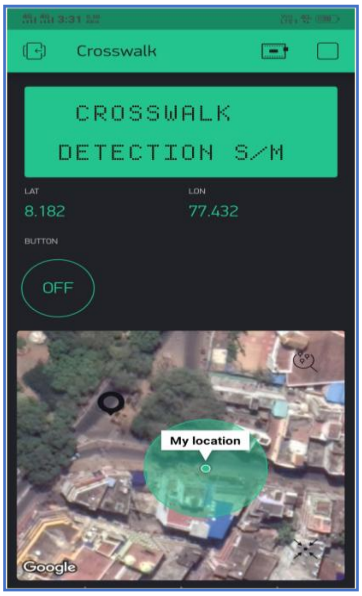
1. User sends his location when facing a street.
2. His position is estimated using binary image and his current position.
3. When the blind user crosses turning we analyses corner intersections and binary images and thereby we can find the exact block where the user is located.

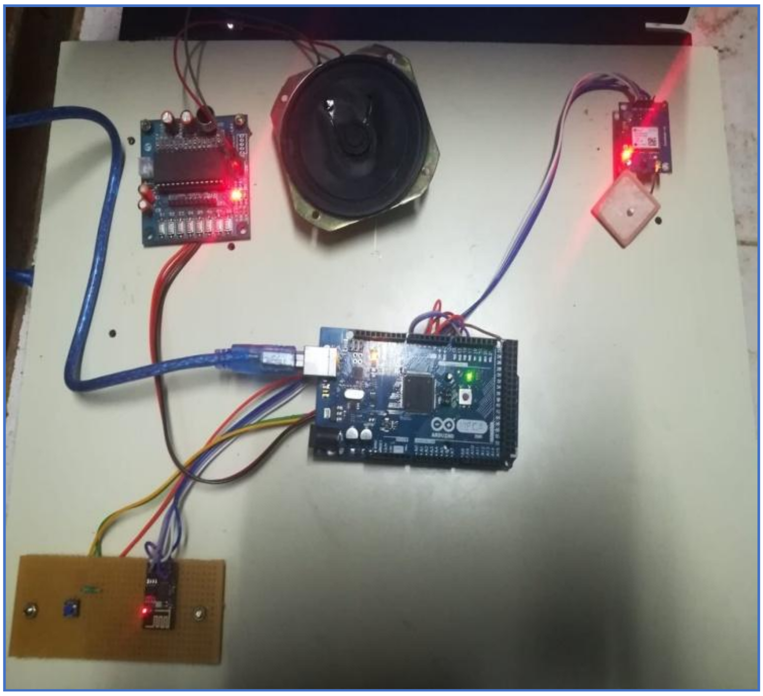
If two cross walks with same distance is found only one is alerted by application such that it would not make any confusion to the blind people.

App feedback

- After detecting and localizing cross walks final output is delivered to blind people through voice alert.
- Voice alert tells nearest cross walk to blind people with its distance.
- Output of frst module is also given as a voice alert to blind people.

SAMPLE SCREENSHOTS





Steps:

1. Coordinates obtained from GPS is given as an input and are analyzed with images captured from Google maps, location of blind user is estimated by applying classification process.
2. Once the cross walk is detected by second module it is delivered to user through voice
3. Once the nearest cross walk is detected and position related with blind user is located it is intimated to him/ her by voice feedback alert. Only the cross walks completely matched with satellite images they are informed to the user and which are remoter from the users normally eliminated for further processing.

CONCLUSION

Proposed model alerts blind people regarding best path to reach their destination that has less number of cross walks and nearest cross walk they have to go along with the distance to reach destination. Proposed model works well for low resolution images also. Cost effective model is proposed.

FUTURE ENHANCEMENT

Further we can enhance our model to recognize traffic signals and to alert them to cross traffic signals safely and independently.

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