Augmented Reality Navigation

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EE368 Project Proposal, Spring 2012, Stanford University
Last Revised: May 2, 2012

Introduction

Figuring out how to get from where you are to where you want to go has been an enduring problem for humankind. It gave rise to the compass, maps, GPS, and Google Maps. Paper maps in particular have been key tools used by people to help familiarize, plan and navigate through an unknown terrain. Several countries, facilities, conferences and a lot of venues provide maps to visitors of the destination. Despite the availability of this helpful tool, there is a lot that can be done to simplify the ambiguity of this 2D diagrammatic representation of an area while enhancing the navigation experience of the user. This is where the advancement in technology can play an intimate role through the development of an android-based mobile phone application for augmented reality navigation. Therefore, our project aims to implement an augmented reality navigation system on an Android-based mobile phone.

Project

Main Objective

Given a basic map of the area (eg: a black and white map of Stanford's campus), the phone user will indicate where he/she is located and where he/she would like to go. Then, when the user looks through the phone's viewfinder, a blue line will be overlaid on walkable areas to indicate where the user should walk to get to his/her destination.

To achieve this objective, walkable areas will be determined via image segmentation [1][2] of the user's initial picture. Then, this segmented image will be matched to a preset map of the area in order to figure out what walkable areas the user can see. The phone will then figure out which part of the user's picture corresponds to the optimal direction of travel and then overlay a blue line on that portion of the picture.

Extensions

1. The user takes a picture of their location. Using this picture, the phone determines the user's location and can then prompt for the desired destination. As in [3], we would need to implement a modified SURF algorithm in order to do image matching.

2. Using the phone's GPS, the user's location could be constantly updated and thus the indicators could be updated in real time. However, it is not clear whether the GPS is accessible without cell coverage.

3. The user takes a picture of an arbitrary map. Using this picture, the phone determines how to get to a given destination.

Android

Yes, this project will use an Android phone.

Schedule

Week	Task
April 30th	Finish proposal (May 2nd) Image segmentation of a basic scene to identify walkway/road
May 7	Match walkway segmentation to preset map Calculate where to place indicator line/arrow
May 14	Introduce more scenes in a small area and check algorithm robustness Begin letting user choose locations on the small area
May 21	Try an extension: either mapping an image to a database or real-time update with GPS
May 28	Start creating presentation Start writing report
June 4	Finish up presentation (June 5th) Finish up written report (June 6th)

References

1. Ohno, K., et al. *A mobile robot campus walkway following with daylight-change-proof walkway color image segmentation*. in *Intelligent Robots and Systems, 2001. Proceedings. 2001 IEEE/RSJ International Conference on*. 2001.
2. He, Y., H. Wang, and B. Zhang, *Color-based road detection in urban traffic scenes.* Intelligent Transportation Systems, IEEE Transactions on, 2004. **5**(4): p. 309-318.
3. Takacs, G., et al. *Outdoors augmented reality on mobile phone using loxel-based visual feature organization*. 2008: ACM.