Project plan for degree projects

PA2537: RESEARCH METHODOLOGY IN SOFTWARE ENGINEERING AND COMPUTER SCIENCE

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Thesis	Tentative title	Improving Augmented Reality in Driving
	Classification	Human Computer Interaction, object tracking, computer vision
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[*] *2012 ACM Computing Classification System: www.acm.org/about/class/2012*
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1 Introduction

Augmented Reality (AR) is a relatively new concept. With regards to its usage in automobile, especially driving, there are only a handful of papers or studies available when just looking in one particular online database (in our case, Inspec). Augmented reality is a constituent of Human Computer Interaction. Basically, the computer aids the user by augmenting (supplementing) the real world in the visual field of the user. Since this is a new thing the main problems are related to discovering the unexplored areas.

Now, where is help from a computer needed by the user? Pretty much everywhere as long as user wants to rely on a computer. While focusing on the driving aspect the computer the help in the following ways: show navigation, show information of objects on the road, describe the points of interest which are in view of the user, etc. This information can be displayed either on the windshield of the car or on head mounted screen worn by the driver. But then the problem would be to repeatedly change the focus of the driver between the road (farther) and the display (nearer). This has the potential to cause some serious problems. Reference [10] provides an un-perfected solution by the use of focal optics by generating an image at the same virtual distance from the user as is the real world object.

Some helpful applications proposed by various authors are: forward collision warning system [5] where the vehicles are tracked and highlighted on the display, description of the buildings in view[1], display the navigation information [4], alerts or warnings during turns or overtaking [3], show a highlighted path in low visibility [1]. Now the main concern is to not overcrowd the display. This "cluttering" will distract the attention of the user from the far more important things [1]. Likewise the information shown should not block the view of the really important objects in front of the car, called "occlusion" [1]. There is not adequate development on elimination of these two crucial problems.

The other less important problems are: the connectivity of the system, the accurate tracking of objects and adjustment of the displayed info, etc. The proposed solutions are to improve the calibration of the on-board camera [2], peer to peer connections amongst the vehicles for data transfer [11],

2 Aim and objectives

The aim of our thesis project is to find solutions to the problems of cluttering and occlusion as explained above.

To realize our aim we have set the following objectives:

- Establish the procedures to identify the most relevant or crucial information to be displayed on the AR system. Deals with the cluttering problem.
- Develop a new algorithm to determine optimal positioning of information so as to avoid occlusion.
- Test the solutions by conducting experiments with a sample population and validate them.

Our ultimate aim is to make sure that the problems mentioned above are adequately addressed and make a contribution to the existing knowledge.

3 Research questions

Research question 1: How to eliminate cluttering of display with too much information?

Research question 2: How to reduce occlusion?

Research question 3: What is the popular choice of information to be displayed?

4 Method

To complete our said objectives we need to use both the qualitative and quantitative research methodologies. For the first objective we need to take input from the people about what they think is important and should be displayed on the HUD. Then based on the input we can identify other interesting concepts that can be applied to obtain the solution.

For the second objective qualitative analysis should be done of the existing algorithms and determine what is missing. This can help us to direct our efforts in the right direction.
The third objective is very important as we test the solutions in a simulated environment and collect the data to validate our claims.

5 Expected outcomes

From first objective we expect a list of things that the people want to view on the HUD and consequently we can come up with the preference rating for each type of information so as to reduce the cluttering effect. The user can set the level of details and choose how much information is available.
From second objective we expect a new algorithm that is better than the existing ones.
From the third objective we can expect a graphical view of the statistics that indicate the success rate of our solutions.

6 Time and activity plan

Scheduled milestones and meetings:

- 20150319: Submit the research proposal to the supervisor.
- 20150322: Conduct the interviews and surveys for first objective.
- 20150324: Start literature review.
- 20150329: End of literature review.
- 20150402: Developed algorithm for second objective.
- 20150410: End of experiment for third objective.
- 20150415: Analyze results and final submission.

7 Risk management

The main threats to our study are:

1. The input from people on the survey may not be entirely accurate due to smaller sample population. This can be overcome by conducting special interviews with experts in the field.
2. The final solutions are not generalizable due to fact that not all people want the same thing. This can be overcome by coming up with option of customizing the solution to the users' needs.
3. As very less work has been done in this particular field, our findings may not be the ultimate solutions as there is always scope for betterment. This risk is mitigated if we update our research in accordance to the new findings.

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