Emerging Technology & Innovation Project Proposal

Augmented Reality in Geographic Information Systems (GIS)

This research project will examine the application of Augmented Reality using mobile devices in Geographic Information Systems. This project is being undertaken as a Capstone project for ITC571 Emerging Technologies & Innovation.

Tracking of project progress, commentary, and project deliverables will be shared via my project blog at http://thinspace.csu.edu.au/jrowe/. This will include weekly progress reports that cover both the defined project activities and the weekly topic activities as part of the ITC571 Emerging Technologies & Innovation subject.

Rationale

Use of mobile devices has become widespread over the past decade, with technological advances seeing small form factor portable devices equipped with high-resolution screens, high pixel-count front and rear facing cameras, a compass to detect device orientation, and location technologies such as GPS. Such mobile device components can be utilised to provide an Augmented Reality experience, where digital information is overlaid on a feed from the existing environment (Rouse, 2016).

Geographic Information Systems (GIS) are used to capture, store, and analyse data relating to positions on the surface of the earth (National Geographic Society). The key to GIS is the location pertaining to a piece of information, such as is its latitude and longitude, address, suburb, or postcode. Therefore any device that enables the capture or visualisation of data based on location can be an effective tool when combined with GIS.

This project aims to examine the potential of using mobile Augmented Reality in the capture, visualisation and analysis of spatially enabled data in the context of GIS. Upon completion of this project I should have a sound understanding this topic area. It is intended that the understanding developed through this research project be utilised in the future development of AR GIS mobile applications.

Methodology

The research performed for this project will take the form of a literature review. This will look to answer the identified research questions, analyse the findings, and develop a conclusion on the suitability of augmented reality with mobile GIS.

Research Questions

In examining the potential for Augmented Reality GIS applications this project aims to answer the following questions:

1. How is augmented reality current used with GIS?
This will seek to identify any existing augmented reality applications that utilise GIS components. Examples identified to date include (but are not limited to) Augview, as well as mobile augmented reality games such as Ingress and Pokémon Go. Examining existing AR + GIS solutions will better inform the subsequent questions around technical implementation and issues.

2. How could augmented reality be applied with GIS?

This question looks to identify potential implementations that either do not exist or could be implemented differently. This question may leverage examples discovered in answering Question 1, and/or examine concepts identified from literature.

3. What are the technology requirements to utilise Augmented Reality on mobile devices?

This question will look to determine the device capabilities required to implement a capable augmented reality experience. This will include the device components required such as processor, memory, compass, GPS, network connection and display. This question will also investigate the technical frameworks required to develop and deliver an AR + GIS application.

4. What are the issues in implementing augmented reality GIS applications on mobile devices?

This question will look to identify issues associated with AR + GIS applications. These may include (but are not limited to) data accuracy and availability, and device location accuracy. For any issues identified, potential solutions or compromises will be investigated and presented in the final project summary report.

Data Collection

Data will be collected and analysed from the following sources:

- Books
- Journal articles
- Articles from technical/IT related websites
- Technical blogs written by industry specialists (GIS, AR, mobile)
- Websites of industry bodies such as GIS and mobile vendors
- Conference presentations by industry professionals
- AR/GIS mobile apps

It is expected that these sources will be found via:

- Online search engines
- CSU Library
- Online journal databases
- Mobile platform app marketplaces

Each resource found is to be analysed for suitability, technical accuracy, bias, and its worth in the context of the questions that are to be answered. All resources are to be correctly referenced and attributed in compliance with the university’s requirements for academic integrity.
Project Plan

Deliverables

Key deliverables for this project include:

- A conclusion on the suitability of Augmented Reality GIS mobile applications. This should cover the answers for all identified research questions, and the conclusions made from critical analysis of the resources used to answer those research questions. To be presented as part of the Project Closure Report and Seminar.
- If found suitable, a recommendation on potential ways forward (broad use case, technical framework, target audience) for the development of an Augmented Reality GIS mobile application. To be presented as part of the Project Closure Report and Seminar.
- Project Closure Report and Seminar to present findings of the project research.
- Annotated Bibliography, a critical examination of the most relevant resources uncovered as part of the project research.
- Project blog entries and weekly status reports.

Schedule

The research component of the project has been scheduled to run over 42 days, starting on 5th December 2016 with the final project closure report completed by 3rd February 2017. The Work Breakdown Structure is shown below.
The identified research questions and project deliverables have been included as milestones amongst the generic resource gathering and analysis items. See Appendix for full Gantt chart.

**Risk Analysis**

Due to the nature of this project, most likely risks that affect the potential success of the project being completed on time and as intended are all related to work capacity and management of resources (time).

<table>
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<tr>
<th>Risk</th>
<th>Mitigation Strategy</th>
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<tbody>
<tr>
<td>Falling behind schedule</td>
<td>Keep track of progress with weekly progress reports. Slack has been factored into project plan to allow for some slippage.</td>
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<tr>
<td>Competing priorities - work &amp; other concurrent subject</td>
<td>Plan out weekly activities for both subjects, allow for catch-up time if one has taken priority. Plan work study leave around milestones to ensure sufficient time allocated.</td>
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<tr>
<td>Limited sources available to sufficiently answer research questions</td>
<td>Broaden searches, use alternate keywords. Seek assistance from library staff. This risk is somewhat alleviated in the topic selection, as a cursory look for sources indicates a sufficient range to work with.</td>
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<tr>
<td>Integrity of sources not sufficient for purpose of literature review</td>
<td>As above, look for alternates using broader keywords and different search origins.</td>
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<tr>
<td>Research and findings too heavily influenced by current knowledge and bias</td>
<td>Critical analysis of any sources to be used. Seek alternate sources that counter or support viewpoints to alleviate confirmation bias.</td>
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<tr>
<td>Lack of engagement with topic and subject</td>
<td>Keep on top of workload using project schedule and weekly blog reports. Share anything interesting and relevant on project blog to promote engagement.</td>
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Appendix – Gantt Chart
References
