CMPUT 302 W14

Project Halfway Prototype Milestone

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Augmented Pen & Paper Interface

Team 4

Group Name: Pen & Paper

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Division of Labour:

Division of labour is fluid and determined by each team member’s current academic workload, unique skill sets, interests, and project requirements & deadlines. Workload will be managed by consensus and twice weekly meetings. Workload will be communicated via meetings, email, Trello. Project tasks that lend themselves to one team member being the primary will always be supported by team consensus. All team members have design input, but one team member will be responsible for final prototype copy. Project management will generally be handled by one team member and documentation by another. There will be one primary programmer, but all team members will contribute to the code base. One team member will lead the experimental testing methodology design, but all members will contribute.

Project Description:

The main objective of this project is to capture and digitize graphical annotation on a paper geographic information system/land use/topographical maps, and be synchronized with relevant audio and video information in a portable fashion.

The project source is Trevor Wiens of [Apropos Information Systems](http://aproposinfosystems.com/). Trevor hopes to use this product with his main product [LOUIS Heritage](http://louistk.ca/EN/heritage-home/), a tool to help indigenous people in preserving, protecting and promoting their traditional knowledge and values. LOUIS Heritage allows text, maps and media files to be stored and used together.

The project is scientifically interesting because a portable geographic map annotation digital capture system integrated with [Natural Language Processing coding](http://louistk.ca/EN/heritage-home/heritage-features/), and based on tracking an infrared source, and does not currently exist. Current partial solutions rely on a [projector](http://en.wikipedia.org/wiki/Interactive_whiteboard#Operation_of_a_portable_ultrasonic.2C_IR_pen-based_interactive_whiteboard) or a uniquely patterned paper and a digital pen (such as [anoto pen & paper](http://www.anoto.com/lng/en/mode/sublist/documentId/1150/pid/480/)) to save written content to a computer. This project aims to remove the need of these requirements for the capture system, which may be beneficial and inspirational to many other scientific developments.

The functionality of the system will be tracking and geo-referencing an infrared dot from a pen on a paper map. First, the map will be calibrated. An audio/video recording will capture the entire session and provide a date/time stamp for cross referencing. When the system picks up infrared signal from the pen, the system will record the coordinates from the map and the date/time stamp of the infrared signal. Wiimotes will be used as the infrared sensors.

The software interface will feature a main screen with menu bar that lets a user enter basic session info on a laptop (map unique identifier, interviewer(s), interviewee(s), date & time), an interface to calibrate the infrared pen to the land use map, an interface to give real time feedback of infrared coordinate capture points in relation to location on the land use map, and menu to control video/audio recording of the session.

Evaluation of Interface/Experimental Testing Methodology:

We intend to execute three tests to evaluate our system.

Test 1. Comparison with Google Maps

Our client had mentioned that the current best alternative is the use of Google Maps. Hence, we intend to compare the speed of using our product with the speed of using Google Maps. We will have location that we pick beforehand and know the result of. We will then ask an individual to select this location using our technology and then using Google Maps. (The order of testing will be randomized to insure fair testing).  Both situations will be timed and we will then evaluate and see if either is significantly faster than the other is.

Test 2. Comparison of tracing or writing with an offset

Our client would like to have both physical written annotations as well as the digital copy we will record. To provide him with this we have two methods, write the annotations first and trace them with our IR pen, or tape a pen/pencil to our IR pen and have an offset calculated.  To test which is a better idea we want to analyse the accuracy of both methods.  We will have a pre-made design on our map which individual will be asked to trace with both set ups (again order of testing will be randomized). We will then compare the output of both methods to the pre-calculated output and see the level of accuracy of both. We want to see if one method is significantly more accurate than the other.

Test 3. Effect of Pen Orientation on Accuracy

The final test will be a simple yet important test regarding how participants will be holding the IR pen. As the participants perform the previous test, they hold the pen in what is the most intuitive manner to them. In this test, they will be asked to hold the pen in a different manner (either holding the pen with thumb on the pen’s button, or the pen is rotated by 180 degrees where the button is held by other fingers), and repeat the trace of a line like in the previous test.

INSERT STATISTICAL ANALYSIS HERE

Heuristic Analysis:

A heuristic analysis will be conducted per the guidelines suggested by Jakob Neilsen. The analysis will be done by 3 evaluators, taking the average of the ratings.

<http://www.nngroup.com/articles/how-to-conduct-a-heuristic-evaluation/>

<http://www.nngroup.com/articles/ten-usability-heuristics/>

<http://www.nngroup.com/articles/how-to-rate-the-severity-of-usability-problems/>

*The following 0 to 4 rating scale will be used to rate the severity of usability problems:*

**0** = I don't agree that this is a usability problem at all   
**1** = Cosmetic problem only: need not be fixed unless extra time is available on project   
**2** = Minor usability problem: fixing this should be given low priority   
**3** = Major usability problem: important to fix, so should be given high priority   
**4** = Usability catastrophe: imperative to fix this before product can be released

*The following 10 heuristics will be used:*

**Visibility of system status**

The system should always keep users informed about what is going on, through appropriate feedback within reasonable time.

**Match between system and the real world**

The system should speak the users' language, with words, phrases and concepts familiar to the user, rather than system-oriented terms. Follow real-world conventions, making information appear in a natural and logical order.

**User control and freedom**

Users often choose system functions by mistake and will need a clearly marked "emergency exit" to leave the unwanted state without having to go through an extended dialogue. Support undo and redo.

**Consistency and standards**

Users should not have to wonder whether different words, situations, or actions mean the same thing. Follow platform conventions.

**Error prevention**

Even better than good error messages is a careful design which prevents a problem from occurring in the first place. Either eliminate error-prone conditions or check for them and present users with a confirmation option before they commit to the action.

**Recognition rather than recall**

Minimize the user's memory load by making objects, actions, and options visible. The user should not have to remember information from one part of the dialogue to another. Instructions for use of the system should be visible or easily retrievable whenever appropriate.

**Flexibility and efficiency of use**

Accelerators -- unseen by the novice user -- may often speed up the interaction for the expert user such that the system can cater to both inexperienced and experienced users. Allow users to tailor frequent actions.

**Aesthetic and minimalist design**

Dialogues should not contain information which is irrelevant or rarely needed. Every extra unit of information in a dialogue competes with the relevant units of information and diminishes their relative visibility.

**Help users recognize, diagnose, and recover from errors**

Error messages should be expressed in plain language (no codes), precisely indicate the problem, and constructively suggest a solution.

**Help and documentation**

Even though it is better if the system can be used without documentation, it may be necessary to provide help and documentation. Any such information should be easy to search, focused on the user's task, list concrete steps to be carried out, and not be too large.

INSERT HEURISTIC RESULTS HERE

Sources:

https://github.com/CMPUT302W14T04/Interface/wiki

http://aproposinfosystems.com/

http://louistk.ca/EN/heritage-home/

http://louistk.ca/EN/heritage-home/heritage-features/

http://en.wikipedia.org/wiki/Interactive\_whiteboard#Operation\_of\_a\_portable\_ultrasonic.2C\_IR\_pen-based\_interactive\_whiteboard

http://www.anoto.com/lng/en/mode/sublist/documentId/1150/pid/480/

http://www.nngroup.com/articles/how-to-conduct-a-heuristic-evaluation/

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