***Pocket Navigator, Tactile Waypoint Navigation: Notes***

What problems are they trying to resolve

* Improve the method in which directions are given to a user from their current location to their destination without using isolate turning instructions

Introduction of System

* Users can leave device in their pocket, while tactile feedback will provide them with instructions for navigating to their destination
* Provide directional information to support pedestrian navigation via the sense of touch

Implementation

* Double-tapping on the map will calculate the fastest route from the users’ current location to the point at which they double-tapped. User then left the device in their pocket and proceeded to ‘feel’ the next direction from the tactile instructions
* Uses a ‘tactile compass’, so the user is told which direction to travel instead of whether go left/right/straight
* TwoPulse, the tactile feedback system they used in this uses 2 pulses to encode a message.
  + If the waypoint is ahead, then 2 equally short pulses are used
  + If the waypoint is to the left, the first of the 2 pulses is longer
  + If the waypoint is to the right, the second of the 2 pulses is longer
  + As an exception, if the waypoint is behind, then there are 3 equally short pulses
* The distance to the destination is encoded in the time taken between a pair of pause’s; the shorter the pause becomes, the closer the destination
* 2 methods in which the device can be used;
  + GPS Heading: Device uses the GPS compass to determine the users orientation, which is then used to provide the next waypoint
  + Internal Compass: User can scan for next waypoint by holding device parallel to the ground and pointing the device in a direction until the waypoint is found and the next direction has been given

Evaluation Setup

* 14 participants had to reach 3 different destinations in a city forest (like central park)
* They had to use different methods of navigation for each destination; Tactile Compass, Map, Both.
  + However the order of use was counter-balanced to cancel sequence effects
* Only the location of the destination was shown, so the users were unable to use the device for the fastest route. They had to find their own route to the destination
* For each of the navigation methods, the following was recorded
  + How fast participants reached the destination
  + How much they visibly interacted with the mobile device
  + How well they were able to spot important objects which were spread out over the forest

Evaluation Results

* People can effectively reach the destinations using the Tactile Compass only
* When using the Tactile Compass, there was significantly less visible interaction with the device
* Between all 3 conditions;
  + No significant difference in number of salient objects spotted
  + No significant difference in time taken to reach the destination
* No statistics reported

Conclusion

* Tactile Compass has no notable disadvantage to reaching a displayed destination in comparison to a map, whilst still offering a more privacy-respectful interaction

Tutorial Notes

* Benefits
  + More private due to their device being in a pocket; no-one knows you are lost or unsure about how to get to a destination

No language behind the navigation system, anyone can understand the pulses and what the pulses represent

* + Less isolating from the environment as you will not have earphones in
  + Social acceptable as no-one is aware you are doing it
* Drawbacks
  + Body will start to desensitize the vibrations as the body will get used to it
  + As directions are given as a straight line, can be frustrating in areas with complex layouts
  + Users will have learn the different pulses
    - If a pulse is missed then it could be difficult to keep track of which pulse belongs to which direction
    - Different people may have different sensitivity for the vibrations
  + System will drain the battery as it takes a lot of power
  + If a user wears thick clothing, pulses can be muffled out
  + If a user is wearing loose clothing, pulses may be played however not felt
  + If a notification is coming through, the user can mistake the notification pulse for a direction
  + Impact of external environment such as walking, sitting on a train etc can make it difficult to feel for the pulse
  + No success pulse, no specific pulse pattern for when you reach the destination/waypoint
* Analysis of Experiment
  + Suitable choice of a environment for testing the system
    - May be difficult to use within a city, but useful for a wide open space
  + If the user feels like they’re in a safe place, then they will be less cognitively aware
  + Makes sense that they were not able to see the route before the experiment began, as that was one of the aspects that they were testing
  + Measures were sensible for time taken to reach destination and also device interaction, however inappropriate for salient objects as we are not told what is classed as a salient object
    - Could have measured the amount of time spent moving towards or away the destination