INITIAL DEVELOPMENT OF A PDA MOBILITY AID FOR VISUALLY IMPAIRED PEOPLE

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BACKGROUND

Navigating in the environment is a significant challenge for visually impaired people. Micro-Navigation, detecting nearby obstacles such as kerb edges, litter bins and uneven surfaces, is achieved successfully via a white cane or guide dog. Macro-navigation, navigating from point A to B involves knowing when to turn, and what street to take. Macro-navigation is considerably harder, and although routes can be learned, this isn't practical in many situations. For example, going on holiday, or business trips. Whilst there has been a considerable amount of work on electronic micro-navigation, less work has been undertaken on macro-navigation.

REQUIREMENTS

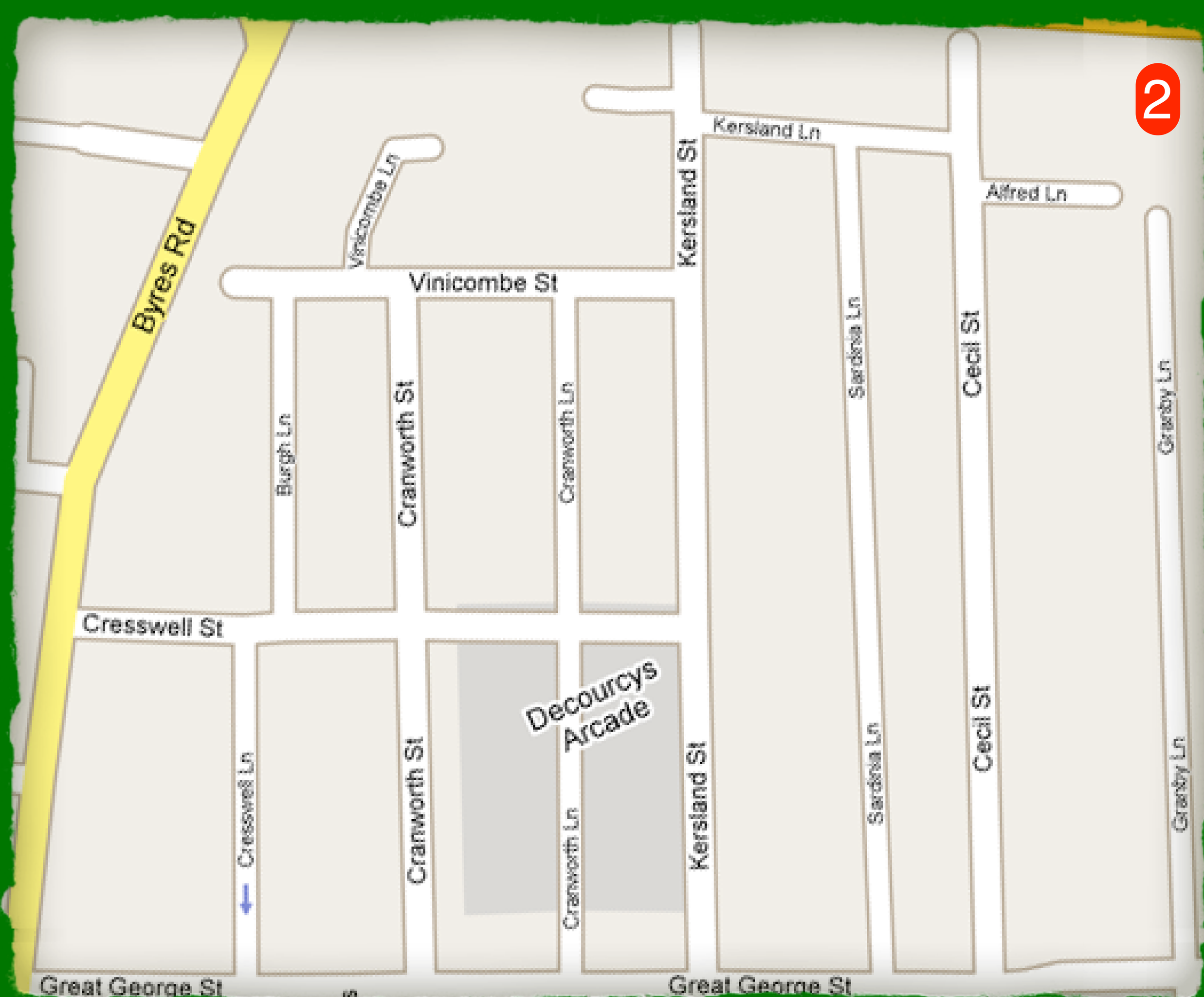
We carried out requirements capture with a congenitally blind individual who was familiar with technology, and the solutions that technology could provide. From this discussion we identified the following requirements:

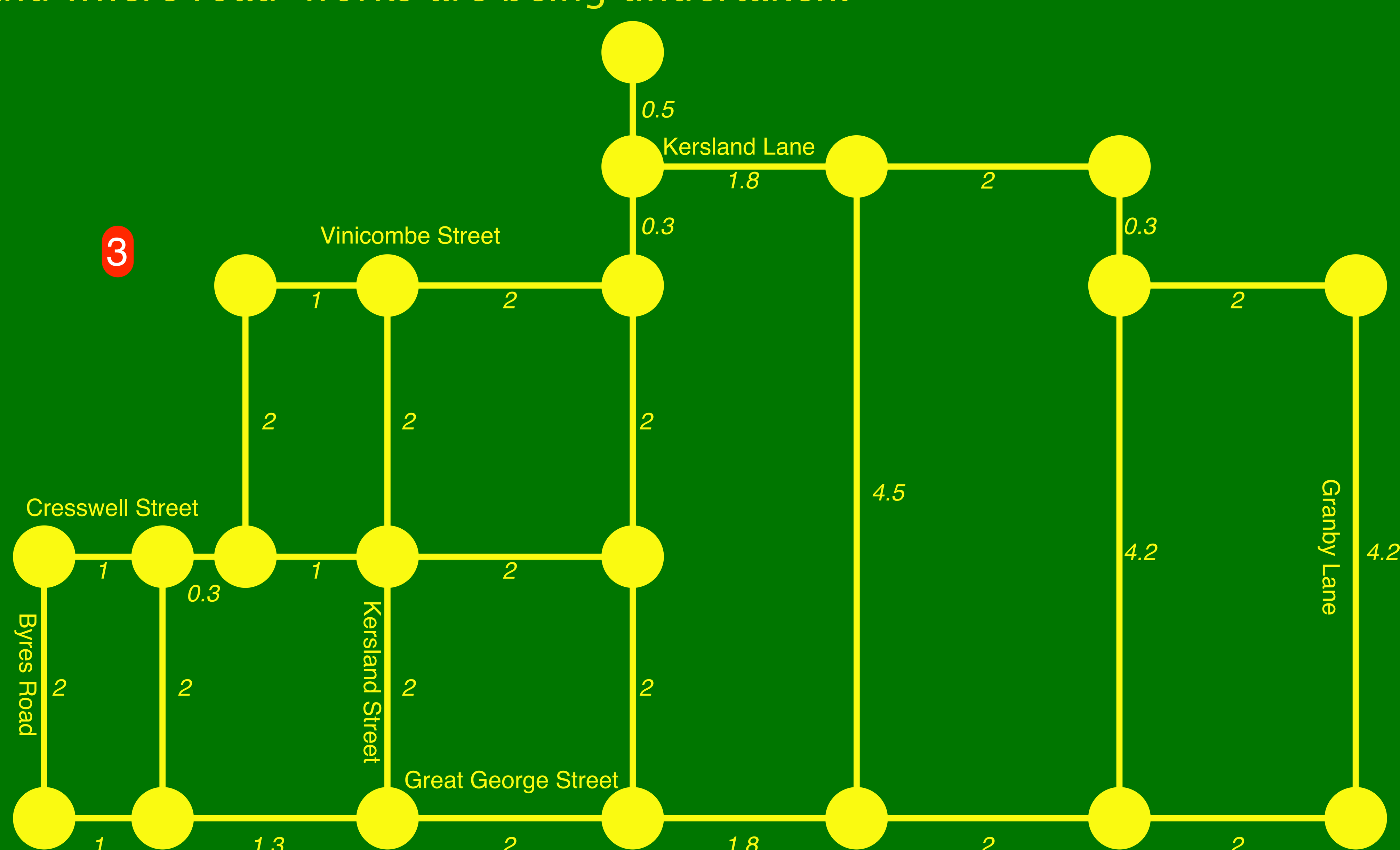
- The system should compliment not replace a white cane or guide dog.
- The user should be able to hear both environmental (traffic noise) and system sound (e.g. a single earpiece should be used).
- The user should be able to use alternative routes to avoid road-works or busy streets.

SYSTEM OVERVIEW

Our system runs on a standard Windows Mobile device 1 and uses a Bluetooth GPS receiver to determine position. A simple raised paper tactile control panel on the screen allows easy interaction. Users select their destination by scrolling through a spoken list. Users receive spoken instruction on when and where to turn. Speech is delivered through a single earpiece to avoid loosing important environmental audio such as traffic noise.

A map of the area 2 is stored in OpenGIS XML format and held by our system as a weighted graph 3. Initially weights are distances, with routes calculated as the lowest sum total of weights between the location of the user and the destination. However in future versions this will allow us, via a Wi-Fi connection, to adjust the weightings of particular streets to avoid undesirable routes such as steep hills, busy roads and where road-works are being undertaken.





FINDINGS & FUTURE WORK

Initial tests have revealed a number of issues, notably that GPS is an unsuitable technology in this environment. Our test area was on a steep hill with tall buildings 4 which lead to poor GPS reception. It is harder for blind or visually impaired people to overcome the failings of location based technology by looking for street names and browsing the underlying map. Our future work will investigate ways of incorporating multiple location sensing technologies to more reliably determine position as well as develop techniques to allow users to "backtrack", or be notified if location sensing is poor. We will also incorporate techniques to allow users to re-weight the graphs to bias against routes with obstacles the user would like to avoid.

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THIS WORK IS SUPPORTED BY EPSRC GRANT GR/S86150/01

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