Supporting Walking School Buses

Christopher Winstanley
Nigel Davies
Mike Harding
School of Computing & Communications
Lancaster University, UK
c.winstanley| n.davies | hardingm @lancaster.ac.uk

Sarah Norgate
University of Salford
Allerton Building
Frederick Road Campus
Salford, UK
S.H.Norgate@salford.ac.uk

Permission to make digital or hard copies of part or all of this work for personal or classroom use is granted without fee provided that copies are not made or distributed for profit or commercial advantage and that copies bear this notice and the full citation on the first page. Copyrights for third-party components of this work must be honored. For all other uses, contact the Owner/Author. Copyright is held by the owner/author(s).
UbiComp'14 Adjunct, September 13-17, 2014, Seattle, WA, USA
ACM 978-1-4503-3047-3/14/09.
http://dx.doi.org/10.1145/2638728.2638791

Abstract
Walking School Buses (WSBs) are becoming an increasingly popular way of reducing school gate congestion. They typically feature a coordinator who is assigned to walk a designated route, calling at several pick-up points that parents can use to join their children to the "bus". However, parents often feel limited by the rigidity of the scheduled walking bus arrival and departure times making it difficult to coordinate the delivery of children onto the bus with conflicting morning activities. As a result, most parents choose instead to rely on car journeys to the school. In this work we demonstrate a mobile system that allows parents to visualise real-time predictions of walking bus arrival times and thus supports more flexible travel coordination behaviours, providing greater opportunities for parents to utilise walking bus services and reduce car usage.

Author Keywords
Walking School Buses, Sustainability, Transportation, Opportunistic.

ACM Classification Keywords
[Information systems]: Location based services

Introduction

The trend towards car use for the school journey [1] is recognised as contributing to school gate congestion and child health problems (e.g. child pedestrian road casualties; poor air quality outside schools; obesity etc).

One form of sustainable school travel is the Walking School Bus (WSB). Walking School Buses typically feature a coordinator that is assigned to walk a designated route calling at several pick-up points that parents can use to join their children to the "bus". WSBs represent a sustainable, safe and efficient way to transport children from their homes to school.

Figure 1: Typical WSB Participants

In our initial interviews with parents about their reasons for not using a WSB, we found one of the most common problems cited was the stress of not knowing when the WSB was coming. With the capabilities of modern mobile technologies there are new ways we can approach these problems and try to remove these barriers to uptake.

Systems such as OneBusAway [2] have demonstrated how real-time bus GPS sensor data and bus stop location information could be analysed to predict arrival times of traditional buses to specifically improve the usability of bus services in Seattle. OneBusAway highlights how real-time awareness of transport mobility, arrival time prediction information and access to mobile visualisations can support greater flexibility in travel behaviours.

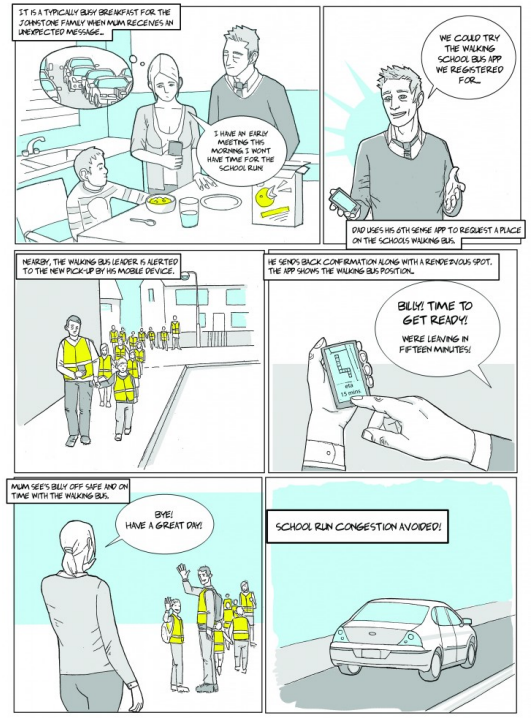

Figure 2: Storyboard Developed for the WSB System (first published in [3])

Working within a multidisciplinary team that includes psychologists, artists, tourism and transport specialists

and computer scientists we set out to design, implement and evaluate a technology intervention that could improve the uptake of WSBs. We invested a significant amount of effort on the initial requirements capture and design of our system. In particular, we conducted individual semi-structured interviews with 29 potential users (13 WSB Coordinators, 6 Head Teachers, 10 parents) from 15 schools. Our initial approach is described in [4]. These semi-structured interviews were supported by a number of storyboards and screenshots of a simple web application that enabled us to provide our interviewees with a starting point for discussion.

Our Application

In this demonstration we will show an application designed to provide a greater awareness of WSB activities in order to improve parental uptake. The WSB application monitors the position of the WSB coordinator taking children to school. It provides parents with information including the location of the WSB, predictions of when the WSB will reach each stop, notifications when the WSB has started and notifications of when the WSB will be reaching the child's stop. The application also allows the coordinator to see which children they are meant to be picking up and at which pickup points. Figure 4 shows the main components of the system, including:

Coordinator Application - Each WSB coordinator is expected to carry a mobile device that provides information to them about the children that they need to pick up at each stop. The app also supports tracking of the coordinator's position.

Parent Application - Multiple parent devices can download WSB routing information, the position of the coordinator and the prediction of the future locations of the WSB. The parent devices upload information about the children getting on and off the WSB. Figure 3 shows the parent tracking the WSB along the route to school.

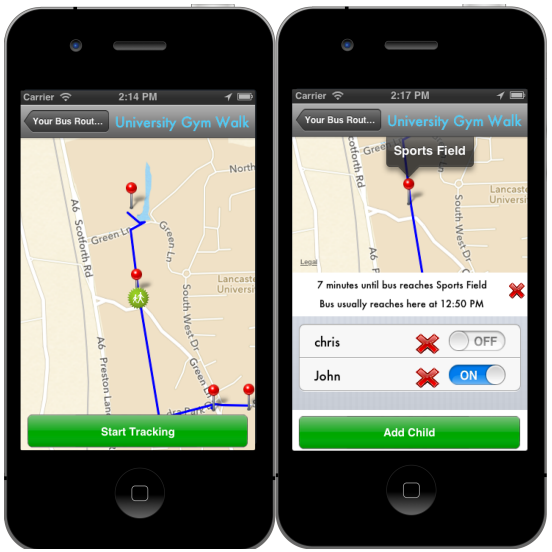

Figure 3: Screenshots of both the Coordinator and the Parent side of the WSB iOS mobile application.

WSB Web Service - Stores information on the WSB route and the whereabouts of the coordinator and disseminates this to the coordinator and parent devices.

Chrono Hub - An open cloud based platform that is used to predict the future state of transportation entities and artefacts based on historic and real-time information (e.g. GPS traces). The chrono hub currently supports the 6ST WSB application that tracks the path of a WSB coordinator along a route on the way to school. This is used by parents to get their child ready for the bus on time and check that their child has got to school. The

WSB app predicts the time it will take for the coordinator to reach the pickup point and relays this to the parent.

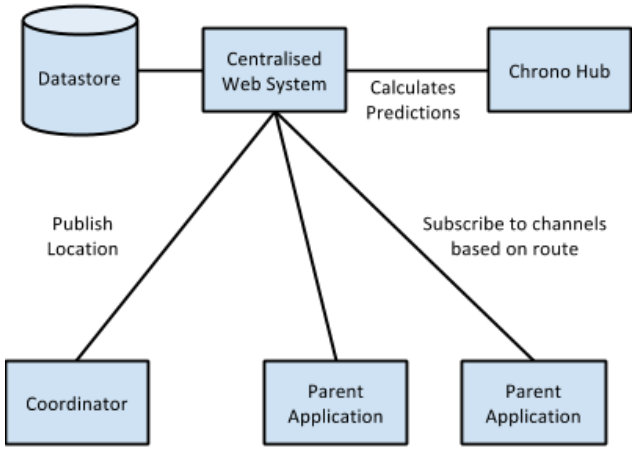

Figure 4: Components of the WSB system.

Demo Description

In this demo we present working versions of all of the key components of the WSB system. Delegates will be able to interact with both the iOS and Android version of the WSB mobile application in order to view the position of a simulated WSB coordinator. They can view how the system handles the addition of children to the pickup points of a route. They will be able to see the system calculating predicted times for each of the pickup points and how it is stored by the Chrono Hub. In addition they will be able to see future traces of the WSB visualised by the Chrono Hub.

Concluding Remarks

The WSB system has now been trialed in six schools both in the UK and in Canada. Trials have varied from short one day trials to longer five week trials. The response from parents, teachers and WSB Coordinators has been overwhelmingly positive. We are currently in the process of recruiting and supporting more schools and adding their routes to the WSB system.

Our experiences suggest that mobile computing can be an effective tool in helping support parents make more sustainable transport choices for their children's journey to school and that acceptance levels are high.

Acknowledgments

This research was partially conducted under the auspices of the RCUK funded Sixth Sense project.

References

[1] Department for Transport. National Travel Survey. Tech. rep., 2011.

[2] Ferris, B., Watkins, K. E., and Borning, A. OneBusAway: Behavioral and Satisfaction Changes Resulting from Providing Real-Time Arrival Information for Public Transit. In *Proceedings of CHI 2010*, ACM (2010), 1–15.

[3] Harding, M., Davies, N., Cherrett, T., Dickinson, J., Norgate, S., and Speed, C. Poster: Sixthsense-shaping travel activities through flexible interpretations of time. In *Proceedings of the 10th international conference on Mobile systems, applications, and services*, ACM (2012), 531–532.

[4] Norgate S. H., Winstanley C., Davies. N., et al. Smarter cities for pedestrians: Innovating real-time information systems to promote walking school buses. In *DE2013: Open Digital - The Fourth Annual Digital Economy All Hands Meeting* (2013).