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A Platform to Explore Interaction with Personal Data Before, During, and After Motorcycle Commuting

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Abstract. The motorcycle could soon be the new frontier for the exploration of human interaction with advanced digital technology. In this paper we present a demo of a system designed and implemented to explore the design of personal informatics tools for motorbike commuting and help us conduct in-situ evaluation of such tools. We present the system architecture and demonstrate the capabilities of the system by presenting a case instantiation in the form of an interactive soft-and-hardware prototype that collects rider's posture data, visualizes the data on the motorbike dashboard in real-time, and pushes the data to the cloud server for later retrieval.

Keywords. Motorbike Riding, Personal Informatics, Cloud-based Platform, Interactive Prototype.

1   Introduction

The motorcycle could soon be a new frontier for the exploration of human-comutper interaction[1], particularly personal informatics. Personal informatics is a set of pervasive and mobile tools that are aimed at supporting people to collect, parse, and present personal information towards self-monitoring and self-reflection [3]. Currently, riders engage with multiple forms of digital information about the motorbike through the 'glanceable' dashboard. They also engage with non-digital 'cues' while riding such as such as traffic movement, road and weather conditions, etc., which constantly keep changing. What if information about the rider's condition such as body posture, lean angles, and heartrate, were also made available as part of the ride experience? This is an open research question inviting exploration. The enabling technology components seem to be mature but focused design efforts work is needed to put the components together and explore and define the multifaceted

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[1]Emerging works in HCI research has focused on exploring the means to display digital information to the rider [1] [2] [4] [5].

space of opportunities.

In this paper we present a demo of a system designed and implemented to explore the design of personal informatics tools for motorbike commuting and help us conduct in-situ evaluation of such tools. We present the system architecture of our cloud based platform enabling wireless real-time data capture, storage and presentation across multiple devices. We demonstrate the capabilities of the system by presenting a case instantiation in the form of an interactive soft-and-hardware prototype that collects rider's posture data, visualizes the data on the motorbike dashboard in real-time, and pushes the data to the cloud server for later retrieval. We speculate this demonstration opens up the space for further designing, prototyping, and evaluation of personal informatics tools for motorbike commuting along multiple directions. For example, one direction is to explore presenting the information not only during the ride, but also before and after the ride. Another is to explore the design of Personal Informatics tools not only for a single rider but a group of riders sharing their data synchronously and asynchronously across devices and experiences.
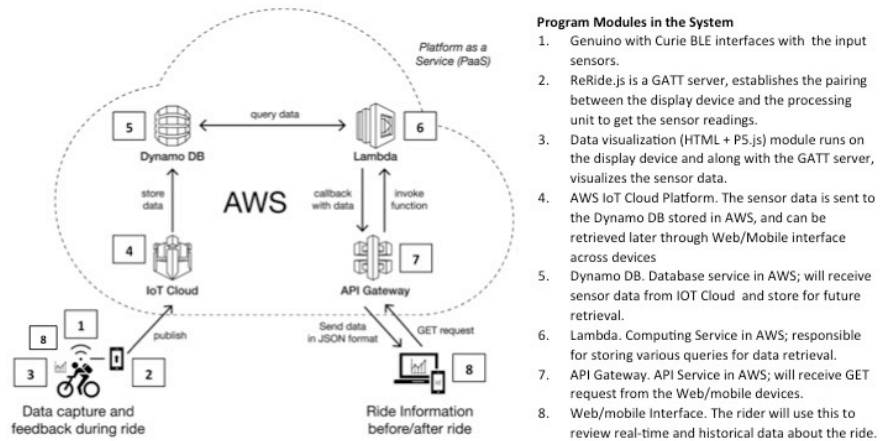
2   System Architecture

Figure 1: System Architecture and Programming Modules

The system architecture for the platform is made up of several individual components and programming modules (see figure 1). An input sensor, such as a Force Sensitive Resistor (FSR) is attached to a Genuino microcontroller with embedded Bluetooth capability, and an Internet connected smart phone make up the environmental sensing device. Data collected during the ride is pushed to the Amazon Web Services (AWS) IoT Cloud Platform, which does all the message relaying and cloud computing. This Platform-as-a-Service (PaaS) has much different functionality required to store, process and evaluate the data sent to it. Any Internet-connected client device can connect to the PaaS and subscribe to or pull information from a custom generated API, which can be visualized over either a browser or a native application.

3 Watching Your Back While Riding: An Instantiation

To demonstrate the system, we present one example instantiation, in the context of tracking and displaying data about the rider's lower-back posture during the ride[2]. Consider the following scenario: *Diva commutes to her work on her motorbike daily. She has been doing so for the past 5 years, and now is in the danger of developing repetitive strain injury of her lower back. To prevent the injury she has to perform stretching exercises, but she does not have the time or the energy at the end of day to do so. She then starts using ReRide. ReRide consists of two parts: a) A sensing part that is part of the seat cushion and b) a display unit that displays this information real-time, next to the motorbike's dashboard. As Diva rides her bike through the traffic she gets continuous feedback of her lower-back posture. During the ride she keeps changing adjusting her posture and stretching her back, thereby performing a part of her prescribed preventive exercises.*

4 Components of the Prototype

The interactive hard-and-software prototype comprises of (see figure 2):

1) A sensor patch placed right beneath the rider's seat consisting of two FSRs, which measure pressure to derive and inform variations in the posture while riding a motorbike. The sensor has a resolution of 1024 levels, with 0 being lowest and 1023 being the highest pressure. We segment this range into four equal parts. Pressure sensor reading are captured and colour coded into these four segments.
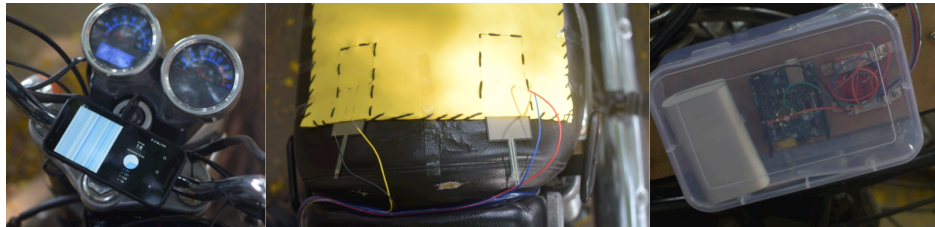

Figure 2: The display, sensing unit, and the processing unit.

2) Two square shaped force sensitive resistors (FSR) are sandwiched between the seat cushion and seat cover. To increase the pressure sensitivity, an additional layer of foam sheets has been applied on top of these sensors. The sensors are connected to Genuino analog input with a 10KΩ fixed resistor in between. Wires connecting sensors with the breadboard are encapsulated inside a rubber tube.

3) A processing unit with the Genuino board (with inbuilt Bluetooth Low Energy module), 9 Volt battery and circuit that reads the FSR value, timestamps it, and transmits it to the display device through bluetooth.

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[2] The motivation behind the design is explained in [1], and is beyond the scope of this paper.

4) A Display device positioned alongside the dashboard, which is bluetooth enabled touchscreen unit capable of running google chrome mobile browser[3]. It communicates with the processing unit via bluetooth, and to communicate with the AWS it uses a 3G/4G mobile internet connection. The Display is divided into two panels (see figure 2). The left panel displays live posture data in the form of a continuous horizontal scroll, displaying information for the past three minutes of the ride. We use color shade of the same tint to indicate how much the rider's back is under stress. The darker the shade, more the stress. The right panel displays rider's posture variation for the entire ride along with the ride duration.

5   Concluding Remarks

In this paper we presented a demo of a system designed and implemented as platform exploring the design of personal informatics tools for motorbike commuting and help us conduct in-situ evaluation of such tools. Currently we are working with industrial designers to shape the sensing and display units as integral parts of a motorbike. We are also working on building the prototype to cover other possible scenarios of engagement with lower-back posture data before and after the ride. We envision how a rider may check information about their last ride displayed on the motorbike just before they begin a new ride. Or dig deeper into their historic data, possibly in combination with other relevant data such as traffic patterns, on their personal smartphones while sitting in a lounge.

In this sense, one can see how the demonstration opens up the space for researchers to further explore the design of Personal Informatics tools for motorbike commuting across devices, experiences, and situations. As such, we present the demo as an invitation to Personal Informatics and HCI community to further explore the challenging, yet underexplored frontier of interacting with computation as part of motorbike commuting.

Reference

1. Bagalkot. N, Sokoler. T, & Baadkar. S, 2016. "Reride: Performing Lower Back Rehabilitation While Riding Your Motorbike in Traffic." In *PervasiveHealth '16*. ICST.
2. Bial, D., Kern, D., Alt, F., & Schmidt, A. (2011). Enhancing Outdoor Navigation Systems Through Vibrotactile Feedback. In *CHI '11* (pp. 1273–1278). ACM.
3. Li. I, Dey. A, & Forlizzi. J. 2010. "A Stage-Based Model of Personal Informatics Systems." In *CHI '10*. ACM.
4. Ogi, T. (2015). Design and Evaluation of HUD for Motorcycle Using Immersive Simulator. In *SIGGRAPH Asia 2015*. ACM.
5. Spelta, C., V. Manzoni, A. Corti, A. Goggi, and S. M. Savaresi. 2010. "Smartphone-Based Vehicle-to-Driver/Environment Interaction System for Motorcycles." *IEEE Embedded Systems Letters* 2 (2): 39–42.

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[3] For the purpose of demonstration we have used the Nexus 5X.