Poster: EasyTrack - Orchestrating Large-scale Mobile User Experimental Studies

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ABSTRACT

In recent years, large-scale data collection has become crucial in Human-Computer Interaction (HCI) research. With a sharp climb of the amount of data being gathered due to an increasing number of mobile and wearable devices, real-time maintenance of Data Quality (DQ) of data-collection campaigns has already become an overwhelming task, especially in large-scale experiments. This paper proposes EasyTrack, a platform that collects large-scale data in an automatized manner. We describe how our proposed solution detects and tackles issues in data collection campaigns in an automated manner.

CCS CONCEPTS

• **Human-centered computing → Human computer interaction (HCI)**; • **Hardware → Error detection and error correction**; • **Software and its engineering → Consistency**; **Completeness**.

KEYWORDS

Human-Centered Computing, User studies, Streaming Sensor Data, Data Quality, Wearable Devices, Human-Computer Interaction

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1 INTRODUCTION

During the last two decades digital sensors have developed immensely and now there is a surprising variety of sensors that can be used in countless types of data-collection experiments. Combined with the wide variety of sensors, difficulty of manual large-scale campaign management task is quite burdensome. Simultaneously, there are important researches about improvement due to Data Quality (DQ) [1, 2, 6] in data collection campaigns. However, in large-scale data collection campaigns, manual interactions (e.g., making a call to turn on specific sensors and to participate ESM and so on) with human subjects is usually unmanageable. Finally, the campaigns compromises the quality of collected data. Therefore our purpose is to enable an automated or semi-automated data acquisition and management of data through a general-purpose platform (EasyTrack). This way makes it possible for researchers to have a scalable environment for performing their data-collection without having to increase the workload they are usually subjected to, making the management task substantially more effortless and boosting users' data collection performances.

2 USE CASE

Our basic use case is as follows : A researcher wants to perform a *physical activity (sensor) and stress level (survey) tracking*. In order to do this he will need to *create a new campaign* with a detailed description, *select and configure the appropriate data-sources* such as accelerometer and periodic surveys. Once the campaign is created and the *well-suited participants are identified after the recruitment process* [9] is done, the researcher has access to the *campaign management* and can then keep track of the general progress of the campaign through its *DQ indicators* [6]. Whenever anomalies are detected automatically, he will be notified, and will be able to directly communicate with the faulty data-providers.

3 PROTOTYPE IMPLEMENTATION

The minimum viable product (MVP)[1] of the EasyTrack platform will consist of three parts, which are a **EasyTrack Core (a centralized server)**, Experimenter's **Dashboard**, and Participant's **Data-Provider applications** (as in Figure 1).

3.1 EasyTrack Core (a centralized server)

Centralized server serves as a focal point of the platform where the all the sensor data measurements and survey logs will be stored. Also, the full logic of the platform lies on the centralized server part. It is planned to be a Django RESTful API [3] server where all the campaign data alongside with *DQ information* [6] will be stored.

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[1] A minimum viable product (MVP) is a product with just enough features to satisfy early customers, and to provide feedback for future product development.

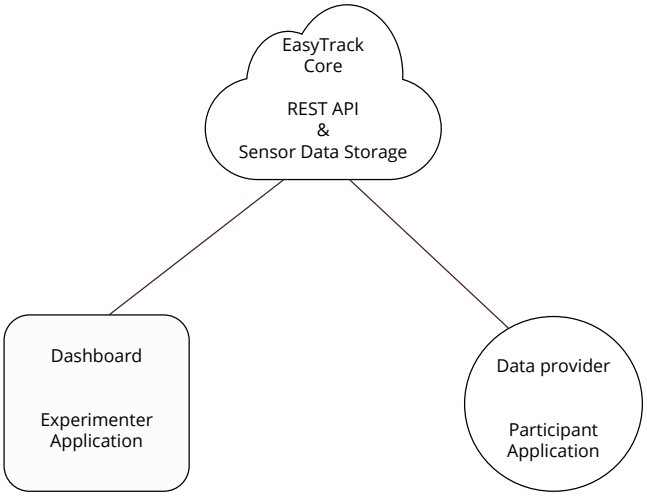

Figure 1: EasyTrack MVP Platform Structure

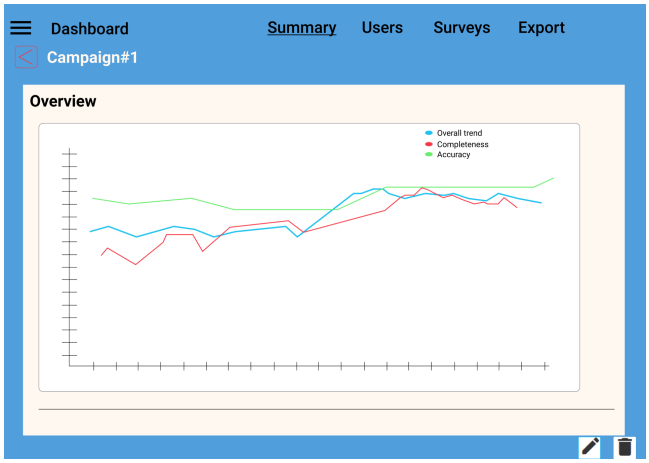

Figure 2: Dashboard Design (using an online interface design tool called Figma)

3.2 Dashboard

Dashboard of the EasyTrack platform is projected to visualize the "health" summary (trends of the gathered *DQ information* [6]) of a running campaign for an experimenter to easily track the overall progress even without diving deep into details about campaign statistics.

3.3 Data-Provider

Data-Provider agent applications are planned to be implemented for smartphones (Android[5]) and for wearable (Tizen [7] smartwatches) devices.

3.3.1 Wearable agent application (Tizen). The data-provider application for Samsung smartwatches running Tizen Operating System (OS) will be submitting sensor measurements with DQ information [6] to the smartphone agent application as means of Bluetooth Low-Energy [8].

3.3.2 Smartphone agent application (Android). The data-provider application for Android smartphones that will collect data from a connected Tizen wearable device along with the data from smartphone's sensors (also survey data from a participant) and will store locally after sending a "heartbeat" message to the centralized server (notifies the centralized server about the update). Later, when the participant connects to a WiFi network, or agrees to send the measurement values to the centralized server, it uploads the gathered data to the server.

4 CURRENT PROGRESS

Currently, an MVP design of the platform has been built via an online collaborative interface design tool called Figma [4]. As a snapshot of EasyTrack platform, Figure 2 shows the dashboard (Experimenter's window) which is described in Section 3.2.

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