UNIVERSITY OF TORONTO
FACULTY OF APPLIED SCIENCE & ENGINEERING
Transportation Research Institute

UTTRI

ATTN: Candidates sought

If you wish to have your app or processing suite (hereby referred to as 'product') considered for the TTS 2.0 assessment of the state of the art in smartphone location logging and processing, please send the following to Siva Srikukenthiran at siva.srikukenthiran@mail.utoronto.ca.

1) Contact information
   - Name
   - Title
   - Organization
   - Telephone number
   - Email
2) Product description

To help us determine which apps or processing suites to evaluate, please provide us with the following.

- List of project-related conference, journal or white papers published, with the most relevant highlighted
- Link to your app/company/lab's website
- Download link for your app (or apps if operational on multiple operating systems)

Short description of the largest rollout of your app or use in processing location traces

- If describing a data collection effort, tell us the number of users who ran the app, as well as the number of person-days of travel for which data was collected and, if available, the number of trips identified;
- if describing a processing suite, let us know how many user-days of travel were processed and how many trips were identified.

We hope to receive many applications, but can only assess a finite number of apps. As such, we need to use product track records to better determine where to focus our efforts. Only mature products with proper documentation will be considered.

Because we will not be recruiting participants, but instead have graduate students recording specific trips, non-English apps do not need to be translated. Whether the app's user interface is in Italian, German, French or any other language, our tests are designed first and foremost to assess the capabilities of apps to run in the background. Turning the app on needs to be fairly straightforward, likewise with making sense of the data produced and understanding error messages, but beyond this, terms and conditions, instructions and other support materials can be left in their original language, and instead explained to the research team if redesign costs are a latitude, longitude, timestamp, accuracy and a few more fields, language should not be an issue on this end. Apps with an active component in another language will be assessed on a case-by-case basis.

How we envision the assessment

Once we have reviewed the submitted documents and determined which products best fit the label ‘state of the art’ (April 20), we will hold a teleconference (April 25 at 11:00 EST) with one representative from each team attending to go over the objectives, plan and methodology. During this meeting, we will also select one type of handset to be bought for the Android apps and one model for the iOS apps. Choosing one Android and one iOS device will reduce variability when assessing the quality of traces produced, as well as battery drain. We will be purchasing new handsets (or at least new batteries) to reduce the effects of wear. Devices will be assigned to one app at a time and will be rotated between apps to ensure problematic devices do not unduly affect results.

The trips chosen to be reproduced will be selected to represent travel made by individuals with differing mode shares and mix of modes within their daily travel patterns, as well as representing trips made by individuals living in different types of urban/suburban setting.

Some of the apps evaluated may contain an explicit active component. In order to assess both the location logging capabilities and overall quality of the data provided, we will seek to use any app designed for active interaction with users both in an active way, responding to prompts, as well as a passive way, assessing what can be learned from traces in the absence of full participation from the respondent. While we recognize the ideal procedure would be to recruit participants outside the study team to run the active apps and see how many times users ignore or forget to respond to device prompts, the focus of our assessment does not allow for sufficient resources to be allocated to properly assess this component.

What participation entails

In order for UTTRI to assess the performance of any app or processing suite, and also be able to categorize apps and processing suites, we need to first be provided with a description of how the product works. As the assessment of the state of the art is not about determining one ‘best’ product, but rather figuring out where the strengths and weaknesses lie within the broader domain of smartphone location logging and travel inference, a black box is of no use to us. This does not mean that we need to see the source code, but a description of how your product functions is a necessity.

Next, in order for us to assess both location logging and processing suites, we need to have access to data in order to process it. Some of the participants will have an app that logs smartphone sensor generated information (location or otherwise), others will have a process for turning traces into useful information in the format of a travel diary, while a last group may have both.

While we wish to protect the intellectual property of all participants and will not ask to see the code used for analyzing traces, we will again need a description of how processing is conducted. In addition, to be able to

process any information, raw traces collected by the apps will need to be made available. UTTRI researchers are prepared to work as middle-persons between the raw data and processing apps in cases where there are concerns over proprietary data formats. This may involve UTTRI researchers running processing suites on raw data provided.

As processing suites are tailored to the input provided by smartphones, settings may need to be modified to account for varying data formats. We will do our best to work with teams on either side to make this configuration stage as pain free as possible. Transfer of raw data (traces and any other sensor data) will be made in an anonymized way, with only UTTRI researchers keeping track of which data were generated by which app. This will allow for researchers and companies generating data through their own app not to be associated with a particular format.

What you will gain from the experience

In addition to recognition as being among the state of the art with respect to either location logging or processing, there are tangible benefits for your company or product. While assessing the strengths and weaknesses of different apps and processing algorithms, we will be able to assign scores to each when employed for a variety of tasks and in different contexts. Measures may include i) percent of travel distance recorded; ii) percent of travel time recorded; iii) percent of trips over 500 meters recorded; iv) percent trips under 500 meters recorded; v) percent trips over 500 m with mode correctly identified; vi) percent trips under 500 meters with mode correctly identified; vii) average distance separating inferred/recorded and actual trip end; viii) percent of links correctly identified; ix) average time and location offset at start of trip (cold start); x) burden placed on respondents (manual restarts or interaction time and 'effort' in the case of active apps); xi) average number of consecutive days without an error; xii) ease of implementation, etc.

When results are reported in any TTS 2.0-related documents aimed at wider distribution, the scores obtained by individual apps and processing suites will not be revealed. Apps and suites will be categorized based on how they function, and for any given metric or urban context, we will report on how well a *type* of app or *approach* to processing performed.

That being said, while no specifics will be reported publicly, individual scores will be made available to the app and processing suite teams with regard to their own product. As such, maker of X app or suite could, for example, find out that the data produced made it possible to detect 70% of trips under 500 meters, that their app led to an average cold start distance of 300 meters in urban settings and 450 meters in suburban settings, etc.

In addition to receiving their own score, app and processing suite teams will be informed of where their product stands within the field. This will allow product teams to better understand where they may want to focus their research and development, and client outreach resources.