
TUIO Hackathon

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Abstract

TUIO is an open framework that defines a common protocol and API for tangible- and multitouch-surfaces. The protocol is based on Open Sound Control and allows the platform-independent encoding and transmission of an abstract description of interactive surfaces, including touch events and tangible object states. While the original TUIO specification [1] has been implemented for various hardware and software environments, there are not as many feature complete reference implementations of the next TUIO generation, although its specification [2] has been finalized and partially implemented by community members. The TUIO Hackathon at the International Conference for Interactive Tabletops and Surfaces is addressing expert users and developers of hardware and software environments for surface-based tangible user interfaces that are interested in experimenting with this new framework, with the goal of initiating the development and integration of new TUIO implementations.

Author Keywords

Tangible User Interfaces, Multitouch Surfaces, Abstraction Model, Protocols and APIS

ACM Classification Keywords

H.5.2. User Interfaces: Input devices and strategies;
D.2.2. Design Tools and Techniques:User interfaces;
D.2.12 Interoperability: Interface definition languages

The TUIO Protocol

Originally developed in the context of the Reactable [4] instrument, the TUIO framework focused since its very beginning on the abstraction of tangible interactive surfaces, including descriptors for marked and unmarked tangible objects as well as multi-touch interaction. The main motivation behind the creation of the protocol was the robust transmission of an elementary interface abstraction within distributed architectures and networked environments. Initial TUIO client implementations had been provided for the most common programming languages and multimedia environments in order to facilitate the creation of alternative applications for the Reactable platform within our teaching activities.

With the growing popularity of multi-touch interfaces the protocol had been since widely adopted by an open source community due to its simple and platform-independent API for the rapid realization of tangible multitouch applications. Until today this community has been also providing a large variety of TUIO implementations for countless software and hardware environments in addition to the original reference implementations. Furthermore its interface abstraction layer has been also implemented in various higher-level programming environments such as gesture toolkits.

While the pronounced simplicity of the original TUIO protocol and its implementations may have been sufficient for the realization of basic multi-touch experiences, it is not reflecting the capabilities of contemporary touch interfaces, while many current implementations also neglect the initial focus on the actual tangible interface elements.

TUIO 2.0 architecture

The tangible abstraction model behind the next generation TUIO framework therefore not only reflects the feature set of state-of-the-art touch surfaces, but also emphasizes the role of tangible interface elements. Moreover, the 2nd TUIO generation also allows to model a wider variety of hardware platforms, input devices and even body parts and is consequently able to represent a more unified framework to various kinds of multimodal surfaces and devices.

The new protocol version introduced many additional features compared to the TUIO 1.1 specification. It allows the encoding and transmission of a tangible interface component abstraction, by defining tokens (tagged objects), pointers (e.g. touch) and geometries (for untagged generic objects) as well as additional symbols and controls in the context of an interactive surface. It also includes timing information, several additional component attributes such as finger pressure, and code descriptors for symbol types such as data matrix labels or RFID tags. TUIO 2.0 also encodes the precise object geometry with general bounds, contour and skeleton descriptors that can be used to describe untagged tangible objects or retrieve additional geometry information for tokens or pointers.

TUIO 2.0 also uses a unified profile for all previously separated tangible object types, such as tokens, pointers and geometries. The state model in the form of ALIVE and FSEQ messages of the original TUIO specification was generally maintained, while the SET messages of the previous 2Dobj, 2Dcur and 2Dblb profiles, were mapped to individual messages within a flat /tuo2/* name space.

Hackathon Objectives

This workshop primarily targets software- and hardware developers that are planning to integrate the TUIO framework into their existing tangible interaction platforms and applications. After an initial overview to the general architecture of the TUIO protocol, it will introduce the extended feature set of the 2.0 specification compared to the present generation and its implementations. The goal of this hackathon is to initiate a wider adoption of the next generation TUIO framework by producing a core set of software implementations and hardware integrations, and also updating the most significant components of the present ecosystem. Finally the workshop will provide a forum to discuss possible design improvements as well as an outlook into a future organization of the TUIO community.

Biographies

Martin Kaltenbrunner is professor at the Interface Culture Lab at the University of Art and Design in Linz. As co-founder of Reactable Systems he had been mainly working on the interaction design of the Reactable - an electronic musical instrument with a tangible user interface. He is author of the open source tangible interaction framework reactIVision and the related TUIO protocol, which are widely employed for the realization of tangible tabletop applications.

Florian Echtler is a junior professor at the Faculty of Media at the Bauhaus-University Weimar. His research interests focus on formal languages for gesture descriptions and design of multimodal development frameworks. Additional topics covered by his research include computer vision for HCI applications, sensor technology and rapid prototyping.

Hackathon Schedule

10:00 - 11:00 Introduction to TUIO 2.0
11:00 - 13:00 Hackathon Part 1
13:00 - 14:00 Lunch
14:00 - 16:00 Hackathon Part 2
16:00 - 17:00 Discussion & wrap-up

References

- [1] <http://www.tuio.org/?specification>
- [2] <http://www.tuio.org/?tuio20>
- [3] Kaltenbrunner, M. & Bovermann, T. & Bencina, R. & Costanza, E. "TUIO - A Protocol for Table-Top Tangible User Interfaces", Proceedings of the 6th International Workshop on Gesture in Human-Computer Interaction and Simulation (GW 2005), Vannes (France)
- [4] Jordà, S. & Geiger, G. & Alonso, A. & Kaltenbrunner, M. "*The reacTable: Exploring the Synergy between Live Music Performance and Tabletop Tangible Interfaces*", Proceedings of the first international conference on "Tangible and Embedded Interaction (TEI07). Baton Rouge, Louisiana