T-111.5360 Research Plan:

Remote Mouse

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1 Introduction

WebSockets is a technology providing an efficient full-duplex bidirectional communications channel between clients and servers. Due to its low latency characteristics, it is well suited for real time applications. The WebSocket protocol is standardized by IETF (Fette and Melnikov, 2011) and W3C (Hickson, 2012) develops an API to enable its use in web pages.

For the T-111.5360 course, we chose the WebSockets topic because we found it interesting and different in nature compared to most other modern web technologies. WebSockets is also a new technology for us in the sense that we do not have prior hands-on experience with it. We expect knowledge of it to be beneficial for us in both future studies as well as in our current and future work.

Our practical research and implementation is going to be about a virtual mouse pointer on a web page, controlled from another web device. WebSockets will be used as the communications technology between the devices.

2 Related work

State of the art in industry and research includes applications made conceptually possible by the nature of WebSockets. Another prominent area of research is exploration of WebSockets' performance characteristics and applicability in performance sensitive applications.

Zhanikeev (2013) explores the practical boundaries of throughput achievable with HTML5 applications. The study uses WebSockets and Web Workers.

Anusas-amornkul and Silawong (2014) compare use of several compression algorithms with WebSockets. WebSockets itself is an optimization over using HTTP for purposes it was not designed for, and utilizing compression with it takes the optimization one step further for some applications.

Cherif et al. (2015) study the use of HTTP/2's server push functionality in order to improve user experience by making video streaming start faster in DASH. They use WebSockets for estimating bandwidth and compare WebSockets over HTTP/1.1 using dedicated TCP connection to WebSockets over HTTP/2 transport multiplexing.

Bassbouss et al. (2013) address multi-screen web application development and the transformation of traditional web applications to multi-screen capabilities. Both the current and proposed multi-screen application models utilize WebSocket in communications between clients (screens) and servers.

Denoue et al. (2014) present a system implementing a virtual project room and real-time collaboration space to facilitate remote, distributed teamwork. The implementation uses WebSockets for inter-client communication and WebRTC signaling.

Kawazoe et al. (2015) introduce an architecture for remote control for home appliances. They address issues related to large scale deployment of real time systems such as scalability and operational costs. WebSockets is the central technology in their implementation.

Trello (*http://www.trello.com*) is a web-based project management application that uses WebSockets for realtime updating its content, like tasks, statuses and assignees. They also use web polling as a fallback if the browser doesn't support WebSockets (Kiefer, 2012).

3 Research idea

The application we are going to implement is a virtual mouse pointer for websites that can be controlled from another web enabled device, typically a mobile phone or a tablet. Communication between the remote device and the host device will be handled by WebSockets. The commands will be sent between the devices thru a server running Node.js with Express.js on top.

Our goal is to first have simple click based navigation that works on a test site. Later we want to be able to use the remote mouse on any web page using a JavaScript bookmark. However, the method of using JavaScript bookmarks won't support page transitions so it can only be used on one page at a time and with single-page web applications. Later we also want to opt-out the basic click based navigation for touch based navigation.

4 Working hours allocation

Research plan	8h
Working basic implementation	48h
State of the art	10h
Midterm Demo	4h
Fluid motion pointer movement	16h
Work on any single page application	16h
Workshop Presentation	4h
Final Report	32h

5 Schedule

13.-29.10.2015	Working basic implementation
20.-27.10.2015	State of the art
3.11.2015	Mid-term demo
3.-17.11.2015	Fluid motion pointer movement
3.-17.11.2015	Work on any single page application
17.11.-3.12.2015	Bug fixes and finishing touches
8.12.2015	Project workshop
17.11-?.12.2015	Final Report

References

Tanapat Anusas-amornkul and Chanapa Silawong. The study of compression algorithms for WebSocket protocol. *Electrical Engineering/Electronics, Computer, Telecommunications and Information Technology (ECTI-CON), 2014 11th International Conference on*, pages 1–6. IEEE, May 2014. doi: 10.1109/ECTICon.2014.6839887.

Louay Bassbouss, Marc Tritschler, Stephan Steglich, Kiyoshi Tanaka and Yuji Miyazaki. Towards a Multi-screen Application Model for the Web. *Computer Software and Applications Conference Workshops (COMPSACW), 2013 IEEE 37th Annual*, pages 528–533. IEEE, July 2013. doi: 10.1109/COMPSACW.2013.96.

Wael Cherif, Youenn Fablet, Eric Nassor, Jonathan Taquet and Yuki Fujimori. DASH Fast Start Using HTTP/2. *Proceedings of the 25th ACM Workshop on Network and Operating Systems Support for Digital Audio and Video*, NOSSDAV '15, pages 25–30, New York, NY, USA, 2015. ACM. ISBN 978-1-4503-3352-8. doi: 10.1145/2736084.2736088.

Laurent Denoue, Scott Carter, Andreas Girgensohn and Matthew Cooper. Building Digital Project Rooms for Web Meetings. *Proceedings of the 2014 ACM Symposium on Document Engineering*, DocEng '14, pages 135–138, New York, NY, USA, 2014. ACM. ISBN 978-1-4503-2949-1. doi: 10.1145/2644866.2644889.

Ian Fette and Alexey Melnikov. The WebSocket Protocol. RFC 6455, December 2011. URL `http://www.ietf.org/rfc/rfc6455.txt`.

Ian Hickson. The WebSocket API. Technical Report, W3C, September 2012. URL `http://www.w3.org/TR/2012/CR-websockets-20120920/`.

Hiroshi Kawazoe, Daisuke Ajitomi and Keisuke Minami. Design and evaluation of large-scale and real-time remote control architectures for home appliances. *Consumer Communications and Networking Conference (CCNC), 2015 12th Annual IEEE*, pages 820–825, January 2015. ISSN 2331-9860. doi: 10.1109/CCNC.2015.7158083.

Brett Kiefer. The trello tech stack, January 2012. URL `http://blog.fogcreek.com/the-trello-tech-stack/`. Accessed: 2015-10-11.

Marat Zhanikeev. Experiments with application throughput in a browser with full HTML5 support. *IEICE Communications Express*, 2(5):167–172, 2013. doi: 10.1587/comex.2.167.