Paper: A Realtime Shared Whiteboard

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***Abstract*—In a personal setting, the ability to jot down ideas and share thoughts is invaluable to both the creative and educative processes. On a global scale, the ability to engage in these activities is dramatically reduced by the physical distance between you. In a packed lecture hall setting, a lecturer can't do much more than talk at their students and hope for the best. Paper aims to provide the shared scratch surface to explore and develop ideas in real time, and allow engagement from all parties.**

I. Introduction

// Ramble to express ideas, add proper structure in the final version.

Our idea is to create a real time shared whiteboard. The idea is simple enough, but quite wide in scope, so our exact remit is restricted to a website that gives a link to a whiteboard, and anyone who accesses this link is able to edit content. There are countless ways this could be extended, some of which are outlined below. The usage of such a page also potentially goes well beyond that of a standard whiteboard. For example playing noughts and crosses with a friend in the US, which is why we've gone for the more general name Paper.

Since realtimeness and scalability are crucial to demonstrate this products viability, the initial aim would be to get a working demonstration of this. Showing that latency is respectable both when many users access the same whiteboard and when many whiteboards exist.

A. Extensions

There are many ways this could be extended, some of our favourite ideas are outlined here:

- Allow submissions to be vetted by the creator of the whiteboard. Perhaps by their own decision or give the option for the group to vote. If a lecturer asks a question, some students could submit answers (as drawings on the whiteboard) and the rest could vote on the ones they think are correct, for example, and the best one can be added to the board (as decided by the owner).
- Since this is simple vector graphics, you can record their application to the board and allow later playback. Perhaps alongside a recorded video call or lecture.
- To monetise the project, a whiteboard could be restricted to ten users, and an appropriate license lifts this restriction. For example an organization or university license.
- Accessing the link after the presentation/discussion is over we can provide a pdf or similar of the final state of the board. Additionally an animation if that feature is implemented.
- Generally improved tooling. Multiple colours, adding images, shapes, perhaps a background pdf so you could draw on a presentation.

B. Implementation

Likely a Kubernetes cluster that stores the current state of the boards and can report updates to this state to clients which subscribe to them. Preferably over sockets due to the latency benefit. The frontend will be written in elm, a typed functional language that compiles to javascript, since it is very efficient at manipulating DOM and Canvas elements.

In general, design decisions should have the central goal of minimizing the latency between writing on the board and everyone with access to it seeing this change. Ideally this latency would be comfortably below whatever the latency of the video feed or other connection has.