Undergraduate Thesis Prospectus

A Classes Management System for Staunton Makerspace
(technical research project in Computer Science)

Surveillance in China
(STS research project)

by

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General Research Problem

How can technology be used to benefit a community?

Technology can be used to grow and shape a community or it can be used to subjugate and control. By observing how technology can oppress, we can engineer with the public good in mind. The Project on Government Oversight taskforce made several recommendations in its report on the future of surveillance, such as requiring judicial authorization of real-time facial recognition, for "exigent circumstance" and establishing clear guidelines for transparency and testing of all surveillance systems (Laperruque, 2019). The taskforce recognizes that technology will be misused if it is left unfettered.

Staunton Makerspace Classes System

What is the best way to design a classes system for the Staunton Makerspace?

Introduction

Our customer, Staunton Makerspace, is a makerspace based in Staunton, VA. A makerspace is akin to a small tool working shop, with the tools available for various functions such as woodworking, metalworking, metal cutting, pottery making, 3D printing, and more. Members of the community can join the makerspace and by doing so gain access to all of these tools, which they can use collaboratively with other members or for their own personal projects. The primary purpose of a makerspace is to make the highly specialized and expensive tools for these tasks available to a wider audience, who want to engage in projects using these tools but are unable to afford these expensive, specialized tools on their own.

Staunton Makerspace has recognized that they have a communication problem. The first problem they face is managing to communicate with their less devoted members, the members who come in less often and tend to not check their email or slack messages as consistently. The second problem is in coordinating classes, as in which class has reserved a room, for when, for how many people, and any

other concerns that may pop up in trying to schedule and organize classes with minimum disruption. This second problem is the focus of our technical project, though we're also working with a team that is trying to solve the first problem.

Currently in order to schedule classes, Staunton Makerspace is using an unmodified version of Google Calendar. For the purposes of scheduling classes and allowing everyone to see when and where classes are, this system works fine. The problem lies in the fact that Google Calendar is solely designed to list when and where events are - it has no inbuilt tools to solve time or location conflicts between classes, or to force individuals who wish to create a class to go through a certain process, to list certain relevant class details, or anything else that Staunton Makerspace may wish their class scheduling system to accomplish.

System Design

The system uses the Django Python web framework. This framework handles database management, an API for the database, page rendering, and dynamic page logic. The source code runs inside a Docker container cluster to manage the individual parts of the whole project. There is a container for the classes management system, the user messaging system, the backend API, and a proxy server that routes requests between the other components. This cluster will deploy to Amazon Web Services (AWS) in production.

The classes management system, in particular, will provide means for class creation, class registration, user certification management, a page for class teachers to approve or deny class attendees their acquired certification (in case someone does not meet the requirements for passing the class), and a page for admins to create and delete individual certifications and machines and to approve and deny proposed classes.

System Requirements

Our main focus for system design is to make sure that our final product is able to closely meet the needs of the customers. To do so, we have started our design process by gathering system requirements from the customers. We have visited Staunton Makerspace to meet with its members and gather initial vision and requirements for the project, and also held bi-weekly meetings throughout the semester with one of the Staunton Makerspace members in order to update requirements and clarify details.

The minimum requirements are the requirements that we have agreed with the customers as necessary for the baseline function of the system. For the minimum requirements, we established that the user, as a class creator, should be able to create their own class and add at least the following details to it: A description of the class, a start and end time, which machine certification is required to sign up for a class, and which machine certification the attendees will be able to receive from completing the class. A user who is looking to join a class should also be able to access a list of available classes that are already created on the web page, see details and descriptions about the individual classes, and sign up for those classes.

The desired requirements are the requirements that were desired by the customers, but not in immediate priority for development. For the desired requirements, we established that a class creator should be able to set a maximum capacity of sign-ups and enforce that limit, as well as be able to change the details of the class once they have been already created. Also, the users, as a privileged administrator, should be able to approve or deny the creation of classes by other users.

The optional requirements are the requirements that were not considered necessary or important by the customers, but will improve the overall quality of the application. For the optional requirements, we established that the user should be able to pay their dues online for the class that they signed up for and request a class to be scheduled for a specific equipment certification that they need. Also, the user, as a class creator, should be able to recommend a class to other users with a certain training certification, send class information to select group of users, see which users paid their dues for the class, and automatically promote the class on the Makerspace Instagram and Facebook. Finally, the user, as a

guild trainer, should be able to update the certification level of people who have attended the training classes.

Nationwide Surveillance in the Peoples' Republic of China

How do Chinese authorities, citizens, and dissidents influence the extent of surveillance in China?

China has a long history of committing human rights violations (Rez, 2015). Chinese authorities use technology to enforce the ruling party's power, and dissidents use technology to resist them.

The ruling party in China, the Chinese Communist party (CCP), seeks to control Chinese citizens' access to information. A party leader has claimed the people requested access restrictions (CAC, 2017). Residents of China must not discuss government regulations online and register online under their real identity. Violators "shall immediately stop transmitting the information" (CAC, 2017). A 2019 report from Comparitech says that, by 2020, China could have 626 million CCTV cameras in use, which is nearly one camera for every two people (Comparitech, 2019).

In 2018, Beijing police unveiled facial recognition glasses connected to an offline database stored on a tablet carried by the officer. The CEO of the glasses manufacturer claims that the glasses can check an individual against a database of 10,000 entries in 100 milliseconds. William Nee, China researcher at Amnesty International, said "it could also make it easier for authorities to track political dissidents and profile ethnic minorities" (Chin, 2018).

Anti-surveillance groups outside of China resist such invasions of privacy by Chinese authorities. A self-proclaimed extension of the hacker group Anonymous has designed art projects to call attention to privacy threats, including scarves printed with many faces and a head lamp that projects a face over the wearer's to thwart facial recognition cameras (HKU, 2017).

During the 2019 Hong Kong protests, protesters tore down 20 new smart lamp posts around the city out of fear that they could have facial recognition capabilities. Hong Kong's secretary for innovation and technology acknowledged that the lamp posts had Wifi and Bluetooth connectivity,

sensors, and cameras with visual analysis and tracking capabilities, but claimed "those functions had never been activated" (Hu, 2019).

Chinese dissidents are resisting surveillance. On October 4, 2019, the Hong Kong government, responding to weeks of protests against the Extradition Bill, has banned the use of masks or face coverings in public. More protests followed this decision. One citizen said: "If no one reacts to this then they can use the emergency ordinance to do anything, including interfering with the coming district elections. If the government can do anything, then Hong Kong is finished" (SCMP, 2019).

In 2017, CCP ordered the Alibaba Group to co-operate with the Chinese government (Lin & Chin, 2017). Alibaba developed a mobile app to distribute Communist propaganda (Li, 2019). Alibaba is apparently complying with CCP's demands. Alibaba owns the *South China Morning Post*, Honk Kong's largest English newspaper (Carew, 2015).

Since 2014, Muslim minorities in the Xianjiang Uyghur Autonomous Region of Western China are enduring cultural genocide by China's "People's War on Terror" (Tiezzi, 2014). The US Department of Defense estimates about 3 million Chinese Muslims are confined in internment camps (Stewart, 2019). Uyghur in Xianjiang are under constant surveillance from facial recognition cameras, iris and body scanners, mandatory monitoring apps, drones, and a DNA database of 40 million people (Coca, 2018).

Advocacies such as Human Rights in China, Amnesty International, and Chinese Human Rights Defenders publicize human rights violations by the Chinese government. Amnesty International and 12 other organizations sent a joint open letter to Google asking it to withdraw from a deal with China to develop a censored search engine. According to Amnesty (2018), "The Chinese government runs one of the world's most repressive internet censorship and surveillance regimes".

Chen and Hua (2015) found an association between Chinese citizens' avoidance of cultural heritage cites and their participation in anti-government protests. Ong and Han (2019) found that protestors in urban China tend to value "greater accountability and transparency" more than democracy.

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