Gesture and Chill: An automated system to watch your favorite Movies

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Abstract
With the imminent decline on movie theater attendance, and consequentially growth of the streaming industry; a new public has emerged. We present in this effort to improve the experience of the home stream significantly. Gesture and Chill is a “remote control” in a box that will control different parts of this experience: from controlling the playback of a given media, to lightning control on your environment.

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H.5.m [Information interfaces and presentation (e.g., HCI)]: Miscellaneous; See [http://acm.org/about/class/1998/]: for full list of ACM classifiers. This section is required.

Introduction
Cinema is dying. Sadly. There has been indications that streaming services, like Netflix, are slowly but surely diminishing attendance to the big screen, reaching its lowest level since 1995 [5]. To this growth of the streaming industry we also add other not so legitimate methods: piracy. In 2007, it was revealed that US studios lost approximately $3 billion on annual revenue from piracy [2]

All this means that more and more people are choosing stay-at-home movies over the traditional experience, thus we should start focusing on how to improve this experience for this growing audience. We present Gesture and Chill, an automated all-around system to improve the streaming experience of its users. Our system consists of an array of RFID-enabled, magnetic tokens for the user to perform playback gestures with; and an illumination control plug to connect your lightning solutions to. This system is capable of media related tasks from playback control to illumination management.

The rest of this document is organized as follows: related work on this topic, a detailed technical description of our system and lastly our conclusions with our experience gained.

Related Work

We can find different efforts to improve the "living room" experience. Starting with Netflix's own "Netflix Switch" [7]. This gadget is able to control your TV, lighting and multiple other features to improve your experience. One interesting fact about this effort is that it documents perfectly the process of building one of these devices, in case anybody would like to incorporate this to their setup. However, limiting the user on the type of lightning that can be used with this setup seems like a big drawback.

Continuing, Jeong et al. presented us with a gesture-based remote control for our TV [4]. In this very interesting effort, the authors presents us with a motion-based gesture tracking to control our TVs. With activities focused on navigation and volume control, their system is able to recognize gestures made by the users and act accordingly. This research, while very interesting, seems like a whole lot of effort to set up. Waving our hands back and forth to select the movie we'd like to see should not be the way to achieve this task.

These issues detected on these approaches are tackled head-on by our system. We approached these faults by presenting the user with a standard power cable to connect any kind of illumination system, and an RFID-enabled tags to identify each movie.

System Description

As mentioned beforehand, we're presenting an automated system to control the factors involved in a good movie-watching experience. This device will be responsible of controlling the illumination of the area used for this task, as well as the playback of the selected media.

In this section we will discuss our approach as well as our challenges in this process with their respective successes and failures.

Approach

Our plan of attack to complete our project was as follows. We first needed to find a way to effectively detect gestures performed in a surface. To accomplish this, we decided to use a combination of a magnetometer and a stroke recognizer. While magnetometers, a device used to, among other things, to measure the strength and directions of a magnetic field [6]; have been used in the literature to recognize gestures [1, 9], we have yet to find an effort that uses this technology to classify unistroke gestures.

The second part of this recognizer is, in fact, the unistroke recognizer. This segment was made possible using $1 Recognizer [10]. This unistroke recognizer empowered us with an expanding framework of gestures, giving us the capabilities of addingour own personalized strokes.

The next component of our device implies using NFC capabilities to effectively identify a movie. NFC, or Near Field Communication, is a set of protocols that allow a device to stablish radio data communication with each other, at a short distance [3].

Lastly, but not of least importance, we have our illumination control module. With the help of a relay, specifically a *PowerSwitch Tail*, we are able to control the status of a connected appliance.

Implementation
The implementation of this gadget consisted in consolidating the aforementioned components into a single device, basically. Controlled by an Arduino and Particle's Photon, we embodied our design in two interconnected devices: a "Gesture Box" and an illumination control box.

Our player of choice will be Plex Media Player. Plex is a media solution based on a client-server architecture [8]. The idea is to have a media server setup somewhere, either hosted externally or in the user's home network so it can serve media in a streaming format to the multiple clients available: iOS, Android, Apple TV, Google Chromecast and web.

This media solution empowers us with an *unofficial* API. With the use of this API we are able to control multitude of functionalities for both the server and clients; but we focused more on playback control: play, pause and stop a media stream.

To add gesture recognition capabilities to our system we made use of a combinations of magnets, magnetometers and an unistroke gesture recognizer. Since our gestures are bidimensional, we are able to disregard the Y-axis and train our recognizer with the appropriate axis. With a sampling rate of 10 Hz we are able to get the relative position of a magnet to our magnetometer, and use these points to generate a stroke of sorts for further analysis.

With our gesture saved, we now move to effectively classify into our classes. A $1 Classifier is an effort by Wobbrock et al. that implements Dynamic Time Warping to classify user-supplied gestures with a 99% accuracy [10]. To this interesting library we supplied an average of 20 instances of each gesture (Play, Pause and Stop). This model, after a very, very short test trial, correctly classified 15 out of 20 instances, for an accuracy of 75%.

Another very important component of our system is NFC capabilities. While magnets significantly reduce the range of our RFID tags,

Challenges
Arduino
TV Show Tracking
Success & Failures

Future Work

Conclusions

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