Requirements Analysis

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Interface Design II

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PROJECT BACKGROUND

There is a common, widely expressed concern that as a whole, all of our various smart devices are creating experiences which are increasingly immersive **and** solitary. Users spend a huge amount of quality time with their screens- according to the New York Times, the average adult clocks in over eight hours of screen time each day, though this figure is from a 2009 estimate and has almost surely gone up in the six years since.

As a result, the fear and complaint echoing around the world is simply: “Stop staring at your phone and interact with humans!” This is a pretty solid argument.

Then again, the opposing mindset is equally strong- digital experiences have opened up a new universe for users, and their immersive nature is not only understandable, but often is valuable or beneficial in some way.

The bright side is that these two mindsets don’t have to be mutually exclusive, by any means. Incorporating our digital lives into the physical world in a socially interactive way reclaims some of these interpersonal experiences that many fear are disappearing, while simultaneously creating more opportunities for the ways we use our technology. That is the goal of this project.

FUNCTIONAL REQUIREMENTS

Physically, this is a small electronic device that emits an interactive projected interface onto any flat surface. Digitally, the device should be able to interface with any existing devices that have Bluetooth capability (or possibly via USB if this doesn’t increase the product size too much, as pocket-sized or smaller is a necessary attribute).

The primary function of the device is to transform any conceivable digital experience, most of which are currently designed to be solitary interactions between a user and their phone, laptop, etc, into a social and/or group experience. This is accomplished via the interactive projector interface mentioned above.

Potential uses for this are extremely varied, and include gaming (projection of tabletop games on the fly is a really cool possible implementation of this), educational tools, art and hobbyist activities, a tool for collaboration, a productivity tool, a cooking aid, and many others.

Since the device’s interface and primary method of interaction is projected, it needs very little physical additions. Possible physical additions include a button for power, a button for switching between different modes or opening a menu, and a port for charging the device.

The interface of the projected surface will, largely, recreate or otherwise emulate the interface of the device it's paired with (pairing it with an iPhone, for example, could result in a simple projection of your phone's home screen). However, for it to be entirely cross-platform and usable for any application, it will probably require some way of setting preferences or choosing between a small number of options. This could be done through the projected interface, and/or through a desktop interface.

OPERATIONAL REQUIREMENTS

One main operational concern is powering the device, and there are other requirements that come along with that. If this isn't connected by USB to a device or some power source, it will need a good battery, and will have to be designed with this **carefully and constantly** in mind throughout both the physical modeling and programming processes. Questions to ask: What's the minimum time this device should hold a charge and operate for? How will it save what the user is/was doing if the device loses power? *Should* it even have a save state, or should it be like any other laptop or phone- if you let it die, you might lose what you were doing?

The 'pair-with-anything' aspect seems to be the most complex operational requirement on the programming side. This probably means planning for future phone/laptop/etc OS releases, which seems like it will be quite a challenge.

Additionally- and this is discussed further below, in the technical requirements section- less programming and maintenance should be required due to the smaller size and shorter intended range of the device.

TECHNICAL REQUIREMENTS

There are existing, commercially available projectors that emit interactive interfaces, and the technical design of some of these can be used for inspiration, although these are currently used almost exclusively as interactive classroom whiteboards. Almost all of those on the market are attractive in either form or function, but they are often too large and covered with buttons (some even come with multiple remotes), or have a niche focus, or are only compatible with MacBooks, etc.

Unlike the more complex products on the market (like the Epson Brightlink, which is a large, multi-button whiteboard paired with a multifunctional remote), this device is not require to emulate all the features of typical digital projectors, which are primarily built to function across comparatively large distances. Instead, it will be designed to work across close-up surfaces, so that it can be paired with smart devices via Bluetooth and/or USB,

then projected onto tabletops, walls, and other flat areas in the user's existing environment. This shorter-range functionality allows for the use of smaller (and overall, less) electronic components, and ideally, results in less programming and maintenance.

For motion detection and the response to physical interactions, there are a variety of options, including active or passive infrared, ultrasonic, radar, and vibration sensors. The Microsoft Kinect, which I think is a highly comparable device when it comes to the type of usability, utilizes a combination of infrared and camera sensors. However, the Kinect does require a higher level of complexity than this device will, and therefore a higher level of technical complexity (but is good for inspiration nonetheless).

The level of necessary precision is a major technical concern, and will dictate some of the complexity of the device. This could fall anywhere within a large range- from precise enough to project a keyboard and read input, to the most basic precision of detecting ballpark distances and angles.

CONCLUSION

There are technical challenges that absolutely exist here, but many of the engineering problems have already been solved in numerous ways, and thus overcoming these challenges isn't impossible. However, the methods of interaction between the user and their projected surface will have to be very carefully designed, otherwise leading to a possible disaster of a product.