

Design Brief: Hand Gesture Interface for Real Time Applications

The design brief describes the “Superhans” gaming controller. The objective of this document is to outline the key elements of the product design.

Innovation

The gaming industry is a prominent player in consumer electronics. Popularity within this sector has significantly risen over the last decade in comparison to other entertainment sectors.

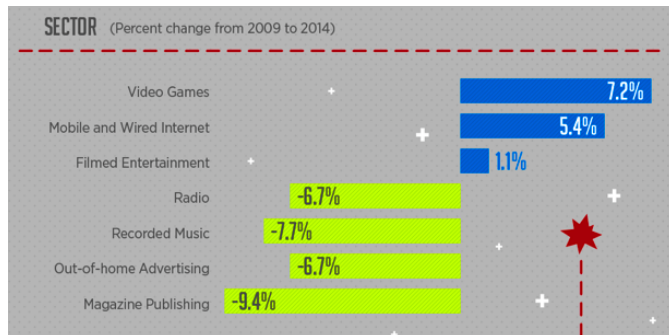


Figure 1: Projected popularity of entertainment sectors ^[1]

Our proposal is “Superhans”, a hand-fitted multi-platform gaming controller. “Superhans” replaces traditional analogue sticks/mouse interface with a combination of sensors triggered by hand gestures.

In the late 20th century, Mattel and Reality Quest released hand gestured controllers. However, these wired modules lacked a ‘slick’ design and were released when game platforms were expensive and lacked popularity. Both controllers lacked multi-platform support. In 2012, the “Leap Motion” attempted to integrate hand gestures with image processing. Although popular this device is sluggish, reducing the frames per second of gameplay for the handful of Mac and PC compatible games. Driver installation further complicated hardware setup and mobility. Similarly the Kinect’s pricing & installation process deters consumers.

The software development kit (SDK) will promote versatile development for other applications requiring hand localisation such as fencing simulators, virtual object interaction, sign language and drawing tools.

“Superhans” will be compatible with all Bluetooth and Universal Serial Bus (USB) enabled platforms. It will automatically connect to smart phones, game consoles via an interface and PC/Mac devices. “Superhans” also automates hardware connectivity and installation without sacrificing weight, mobility and performance.

Technical Communications

The technical aspects of the “Superhans” system can be split up into several main blocks as shown below.

Each team member has been assigned a specific role in the production of the systems. Tristan is writing low-level drivers for the microcontroller. Hans is in charge of the design and ascetics of the glove with Rashid. Anurag is designing the sensor data decoding algorithms. Luke and Jason will look at the calibration and key event mapping Graphical User Interface (GUI).

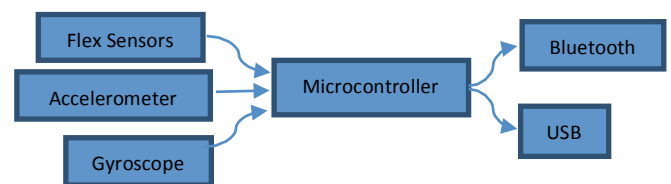


Figure 2: A block diagram of the “Superhans” controller

Design Feasibility

Since we are limited by time constraints, it will be challenging to achieve a fully functional cross-platform controller. Therefore an iterative design process will be implemented. In the first iteration, “Superhans” will be equipped with an accelerometer and one bend sensor. This initial prototype will only be functional for Windows games. The next iteration will integrate a Bluetooth module for wireless connectivity. The final iteration will increase accuracy by adding another three degrees of freedom. If time permits, “Superhans” will be cross platform compatible accompanied by a GUI with calibration and key event mapping.

Although gaming industry is a good target market for generating revenue, it can be beneficial for teaching sign language hand gesture.

The software will be optimised to reduce computation time and minimise latency giving the user an undesirable gaming experience.

Legal Issues

“Superhans” uses open source software. Additionally there are no patent clashes with releasing an ARM chipset within our product as long as it’s not marketed under ARM’s branding. The same is true for the Bluetooth chipset.

Pricing

Accessories such as game controllers own 10% of the market share, comprising a \$2bn industry in the United States alone.

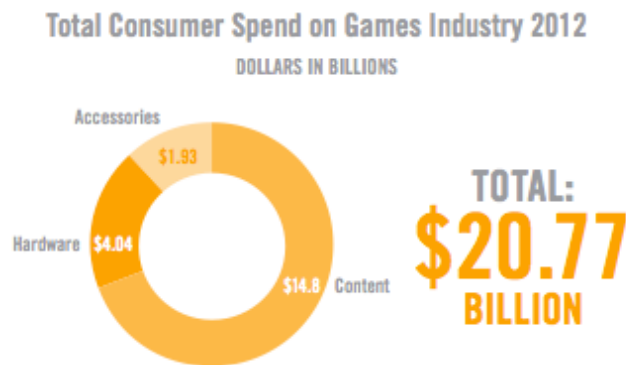


Figure 1: Distribution of US consumer spending within the gaming industry ^[2].

“Superhans” prototype manufacturing costs are estimated at £30 for the wired module and £50 for the wireless. Considering bulk production costs, “Superhans” will be competitively priced. For example, the recommended retail price of the Xbox One controller is £54.99.

Sustainability

To promote productivity in the developer ecosystem, “Superhans” will offer open source libraries in a SDK. Furthermore, all code used in the design as well as a step-by-step guide to constructing “Superhans” will also be made readily available online. The aim of this strategy is to ensure an organic growth of features and expansion of user applications through iterative global collaboration. The sensors used in our design are all hand made from plastic and copper wires found in abundance. Secondly, it was made sure that the glove used was made of materials, which can be recycled or removed and used elsewhere when the product estimated life span is over. The glove that will be used is the Storm “SixSixOne” which uses 50% leather which can be either recycled or reused elsewhere, 40% polyester and 10% cotton, both could easily be recycled using known recycling means.

Where possible circuits will be designed to be easily salvageable or repairable. Finally, the power source which will power our product will be a rechargeable 9 volt battery to avoid throwing away used batteries which contain heavy metals which cause great harm to the ecosystem.

This will be compatible with low end hardware specification to deter platform updates.

Usability

“Superhans” targets the average gamer – A 30-year-old male ^[2]. The prototype glove will be medium sized to serve the majority audience.

“Superhans” will weigh around 50g to 75g, which is comparable to the weight of an average wristwatch. “Superhans” will be incorporated with a padded glove for a comfortable user experience. This will allow several hours of gaming without causing strain injuries, blisters and carpal tunnel syndrome; which are common problems faced after extended use of traditional hard button controllers. The product will be accompanied by a GUI and a help page for general assistance.

User-centric design

User feedback will be harvested and acted upon at each stage of the design process in order to accurately build up a complete picture of the user environment and their goals in using “Superhans”. A pre-prototype survey has already been conducted on our target audience and a group of beta testers has been identified. The praise and criticism of this group will be constantly reassessed in order to maximise customer satisfaction before the initial product release.

Engineering Ethics

It should be made clear that the design of “Superhans” is carried out with the intention of bringing benefit to human society.

Within the time and budget constraints the device is mainly focused on enhancing the gaming experience. But in the long run the benefits to society are endless: for example the device can be used to read sign language gestures.

It is also vital that the students involved are truthful and impartial to the ideas brought up by other team members and be loyal by adhering to the criteria imposed by academia; for instance keeping the budget under £100 and not purchasing components without any consent.

References

- [1] PC gaming vs. consoles, the infographic, Sebastian Anthony, ExtremeTech.com [Web-Documents, 2011].
- [2] 2013 Sales, Demographic and Usage Data, National Purchase Diary (NPD) Group/Games Market Dynamics, US. [Web Document, 2013]