**Introduction**

I am going to introduce our innovation, namely BrainPort Bluetooth Television for Blind (BBTB), which is a personal system specially design to blind people. It consists of a pair of glasses with camera(sensor), a control tablet and a nano chip(sender). With this innovation, a blind person can "see" by receiving the electronic signals which are sent from a pair of glasses to brain via a sender connecting to user's tongue, instead of receiving lights with his/her eyes. According to the information provided by World Health Organization, [1]about 285 million people are estimated to be visually impaired worldwide, which is [2]20-25% of total world population in 2013. It shows the needs of BBTB globally.

**Existing Innovation - BrainPort**

BBTB is actually based on an old innovation namely BrainPort. BrainPort does almost the same as BBTB does but with two major shortcoming. Firstly, BrainPort can only shows black and white but not a colourful image. Although user can see a object, he/she cannot determine the colour, which may cause inconvenience. Secondly, BrainPort requires a wired sender connecting between a sensor and user's tongue. It would affect the user from eating and talking. Focusing on these two shortcoming of BrainPort, we improve the design and innovate BBTB.

**Improvement**

To make the image colourful, we use the technology similar to colour television. In human eyes, there are three kinds of cone which are used to sense red, blue and green lights respectively. These cones would send signals to the brain depends on the strength of each colour light. For example, when you see a green light, the green cone would send a large signal to the brain while another two send only a little or even none of signal. By receiving signals from these cones, a colourful image can be formed in our brain, which we called it "vision". Colour television uses similar technology to combine red, blue and green lights to form a colourful screen. Based on the technology of colour television, BBTB can send 3 different signals with sender atop user's tongue to the brain replacing functions of those colour cones in eyes. Brain would receive exactly the same electronic signals as how eye cones send. In other words, generally, there will be no difference between eyes and the sender.

Besides, to make it more comfortable and convenient when eating and talking, we would use a embedded chip over user's tongue instead of using a wired sender. In the original design, user must use a sender with a cable connecting to the sensor on glasses. Once if the user needs to eat or talk, the sender would drop out easily, which make inconvenience. However, in the design of BBTB, we instead use a nano, light chip to replace the sender. It works exactly the same but in a wireless way: this chip can receive information sent from the sensor on glasses by using Bluetooth technology, and then transfer it to the brain by sending electronic signals, like how a Bluetooth mobile phone headset works.

**Benefits**

Can "see" the surrounding must be the major benefit to blinds absolutely. With BBTB, users with visually impaired can enjoy their daily lives as normal as others, which can reduce inconvenience or troublesome. For example, they do not need to fear danger in front of them, and they can easily grab tiny objects such as bottles, bags or keys. With new vision, the people can even return to work: visually impaired which can be solved by BBTB is generally the only factor that causes blinds not possible to work.

**Feasibility**

In terms of technical feasibility and operational feasibility, BBTB is workable to be produced and sold to market. Since the development of BBTB is based on an existing innovation - BrainPort, key barriers on developing the basic system are solved and thus it would be much easier on applying new features - colourful image and Bluetooth technology. To achieve colourful image, a nano chip which replace sender needs to send three chains of electronic signal to tongue with different wavelength. Besides it needs to be charged wirelessly. Based on the development of chips and nano-technology, it is completely practical to make a nano chip to finish the work, and, by using Bluetooth, the chip can be charged continuously. To receive information from external sensor, the chip must require Bluetooth function as well as a Bluetooth headset in order to connect to the sensor. Based on existing Bluetooth products, it is also practical to produce the sensor and nano chip with Bluetooth functions installed. After BBTB is produced and is being used, there are two main problems for operation: The user must remove and turn off the glasses before sleep. It may be annoying to search the glasses after awake. It is possible to include a alarm function between glasses and nano chips: when they are apart from each other for a constant distance, the glasses would alarm to notify the user. With the function of sound, user can find his/her pair of glasses soon in the darkness. The second problem occurs when any component of the system does not function well and needs to be repaired. One possible solution is to set up a team which is namely "Repair Team", with a phone hotline which provides to all users for questioning and asking for help.

**Limitations**

Although BBTB sounds perfect, it is only a combination of electronic devices and may be broken down. It does not provide a life-long solution to people who are visually-impaired as their eyes are still not functionable. Besides, the costs on materials may not affordable: it is because nano-technology is currently in developing phase and thus it is rare in market.

**Conclusion**

In conclusion, BBTB can neither provide life-long solution nor affordable in recently days. However, focusing on technical aspect and operational aspect, BBTB is feasible to be produced and sold to market, with benefits on person and social.

**Reference**

1. World Health Orgainzation, "Visual impairment and blindness" Internet: <http://www.who.int/mediacentre/factsheets/fs282/en/>, Oct. 2013 [Nov. 17, 2013]
2. Geohive, "Current world population (ranked)" Internet: <http://www.geohive.com/earth/population_now.aspx>, Nov. 16, 2013 [Nov. 17, 2013]