Innovation of Touch Projector Technology and its Purpose

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Abstract—The primary objective of this article is to explain about touch projector technology concept and how to use it. This paper intention is to look at the present touch projector as a new technology aimed to enable performing tasks as a huge touch screen. This paper briefs on the historical background and provide review of three recent devices which are TouchPico, Cicret Bracelet and Dell Interactive Projector S520. The discussion focuses on their uses in business, education and entertainment. Additionally some areas of improvements are highlighted such as the return value and surface problems. Finally, this paper offer some suggestions to make the devices better.

Index Terms—Cicret Bracelet, Dell Interactive Projector, TouchPico, Touch Projector Devices.

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1 INTRODUCTION

THE touch projector technology "magic" is that it is able to turn any surface into a touchscreen. Touch projector comes in a separate dedicated device, which varies in sizes, depending on the resolution and space of display area. It is able to display the contents from any supported compatible software such as Windows 8 and Android. It can be displayed on any suitable surface such as data show, white board, wall ,arm or the interactive table for 16-100 inches projector size. Users can interact with the multi-touch screen by using the touch projector stylus pen, fingers or traditional dry-erase markers.

The technology has a strong demand since it make project reports or lessons to become something special. It provides the ease of interaction with the touch screen for many people at the same time, sharing the ideas and encourages collaboration with a complete interactive projection solution that combines the functionality of a whiteboard with the features of a multi-touch display. It helps the educational institutions to accomplish the effective learning process as in Figure 1.

Figure 1. Epson-595Wi touch projector used in a classroom

In addition, businesses can conduct meetings in a more

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interactive way. This technology works by sending a signal from the tiny infrared emitter in the stylus to the built-in infrared camera in the Touch Projector. From here, the signal is processed by an image processor and converted into a touch screen at 40 frames per second or more. Touch projector promote active audience participation with a large, interactive touch screen that helps encourage engagement and attention. There is a trend of new companies in trying to integrate this technology with smart devices. However there are obstacles preventing it to go mass market such as lack of high-resolution, bulky in size and low brightness level.

2 LITERATURE REVIEW

2.1 Historical background

Boring, S., Baur, D., Butz, A., Gustafson, S., & Baudisch, P. [1] said: in 1992, Tani et al. proposed to remotely operate machines in a factory by manipulating a live video image on a computer screen. Touch projector, a system that enables users to interact with remote screens through a live video image on their mobile device. The handheld device tracks itself with respect to the surrounding displays.

Touch on the video image is "projected" onto the target display in view, as if it had occurred there. This literal adaptation of Tani's idea, however, fails because handheld video does not offer enough stability and control to enable precise manipulation. Later, many experts try to address this with a series of improvements such as building a separate device, which has its own operating system.

2.2 Overview

The prototype technology turns any surface such as walls, tables, or floors into an interactive touch screen. This has been in development for quite a few years. Nowadays, the technology has matured and development has been quite successful. Almost anyone can get his or her hands on that device. There are many variants in the world market which surrounds on the idea of a touch projector. Many of them are available for sale online. On the other hand, those that are still under the development stage, some companies allows pre-order.

Many international companies are working hard and competing to produce the smaller size and better quality touch projectors. It is also built with features to make it more attractive for the consumers. Following the market dominance of Android OS, more consumer prefers a

device that support Android. This demand is answered by TouchPico projector, an interactive Android based touch-projector. What makes it more interesting; it has the capability to download unlimited number of applications from Google Play and can be used like a normal mobile phone device.

For those consumers who like their own operating system, they can use a wireless streaming of PC or Mac. It is a tiny handheld projector that allows the consumer to use Infrared Stylus to touch the wall (like smart phone touchscreen), as the projector can read touch inputs and a portable, handheld gadget for those on the go. It is slightly heavier than a Samsung S4 phone and just about the same size. Easily fits in your pocket or your briefcase.

The second device is Dell Interactive Projector S520. It can turn any presentation into an interactive event. It has the essential ports for wired connectivity and wireless options to avoid hardwiring network and video cables. This helps to save time and money on installation. The S520's wireless capabilities are developed using Intel® Wireless Display (WiDi) and Miracast support, enabling easy pairing with various WiDi-enabled devices. The result will be smooth video streaming. Not only that, the WiFi connectivity also offers wireless compatibility with virtually any laptop, tablet or smartphone. Figure 2 is a photo showing a Dell Interactive Projector S520.

Figure 2 image showing Dell Interactive Projector S520

It comes with multiple ports including USB, RJ45 and HDMI and all these allow various wired-device connections and easy integration with existing networks. Dell Interactive Projector S520 is designed for outstanding performance in a variety of room conditions, be it classrooms, conference rooms and even small offices. The complete interactive projection solution is designed for easy, precise installation of the projector, wall mounted and a whiteboard too.

The S520 projector also includes interactive projector, remote control, custom 87-inch dry-erase whiteboard, wall mount, laser curtain and two styluses. On the other hand, Epson EB-595Wi Interactive Finger-Touch Projector is also available with similar features of TouchPico and Dell projector. At the same time, Microsoft is trying to join the bandwagon through a partnership with German startup Übi. They are working together on a projector which is able to turn any wall or surface into a multi-touch display. The first Kinect system established was Kinect Sensor for Xbox 360 where Microsoft works natively with the Windows touch-screen interface. With this, the icons can be clicked by touch and photos can be zoomed in and out of using multi-touch gestures, all of which the system supports. Unfortunately, until now it is still under the development stage.

Figure 3 image showing Cicret Bracelet

Another worth mentioning touch projector is Cicret Bracelet as shown in Figure 3. The Cicret Bracelet is unique because it uses the skin as a new touchscreen. A user can read e-mails, play the favorite games, answer calls, check the weather, find the way to any place, and basically do whatever you want on your arm. It uses the TouchPico projector which has 8 long-range proximity sensors and a pico projector that project the interface on your skin. The sensors detect your finger position and send the information to the bracelet. It has an accelerometer, vibrator, snap button, WiFi component and Bluetooth. The developers are working hard to make this product a reality.

2.3 Practical Application

The versatility of touch projector has become very popular in recent years. No surprise here, no one can deny how useful they are. There are many benefits to having a touch projector in any institutions or home, far more than most people realize. However, the truth is, only few people actually can get the full benefit out of these projectors compared to the many features a touch projector can deliver.

EDUCATION

The biggest benefit of touch projector technology is in education. The easiest solution for classrooms across the world is to use touch projector. It enables the teacher and student to perform functions such as writing on the interactive touch surface with the stylus, drag-and-drop images or text from one place to another. It helps the teacher to display the lesson with sound and let the students engage with educational multimedia activities by drawing/writing the answers, watch simulations and view graphics. The portable device can be transferred from classroom to classroom, eliminating costly hardware upgrades especially in the rural area schools.

BUSINESS USE

Touch projector also helps businesses in carrying out business activity by providing interactive visual display. A manger can communicate so many different ways with his workers. Sending an instruction, progress discussion or learning how to figure out any problem by displaying it on a touch screen and directly interacting with it.

ENTERTAINMENT

Gaming may become one of the strongest reasons to buy a touch projector. Kids always wish for a bigger screen to play Angry Birds. With a touch project, it will become more fun and interactive by simply touching the wall. Other fun uses could be the parents want to show their favorite movie in a child's bedroom, while camping or on vacation. All in one, no extra pieces needed. Another one potential hit of touch projector is for people who are engaged with physical activities. Two examples of these are practicing yoga pose or learning a golf stance. With a touch projector an enlarged video tutorial will be like having the trainer in front of you.

2.4 COMPARISON

From the previous discussion, touch projector has amazing features. Developers were able to use this technology to be the beginning of the 'Future is tomorrow' concept. With more research and design, consumer will be spoilt for choices. Consumer would evaluate between ease of use, cost, durability and power consumption. A summary and comparison of the three touch projector mentioned before, the TouchPico, Cicret Bracelet and Dell Interactive Projector are tabulated in Table 1. Unfortunately, Cicret Bracelet details are not readily available due to it is still under development even with contacting the developing team members.

3   DISCUSSION

Everybody can agree that touch projector technology can made life easier and more comfortable and that it can enabled us to perform tasks that we could not do otherwise with a normal projector. A list of the benefits of this technology would be very long indeed. However, as with almost everything else, a human creation has its own weakness. It might be missing important details to capture a user's interest. The following discussion include some weak points where the touch projector devices should avoid.

Firstly, touch projector technology is not a necessity nor there is an urgent need for it. Rather, it tends to make a teacher's or a businessman's lives more complicated. The value of this technology is not in the money, but in which extent user requirements and how to simplify everyday life against the monetary value paid. There are many uses of touch projector devices in the field of entertainment and gaming, but when it comes to paying the money, one will consider whether the device is worth the money. For example, a businessman can afford to pay more than $ 4,000 for a Dell interactive projector because he can justify it with the potential business opportunity that resulted from using the projector.

Another example of value for money proposition is in educational process. Nobody can deny that projector will enabled teacher to share information with speed and ease especially when teaching, but at the same time, it creates lack of interaction between the student and the teacher. This point highlights the importance of having Dell Interactive Projector which has its whiteboard and two stylus with screen size 100". The resolution is high at 1280

TABLE 1
SPECIFICATION COMPARISON

Criteria	TouchPico	Cicret Bracelet	Dell Interactive Projector
Cost (USD)	$450-$600	$600-$700	$4,129
Availability	Pre-order	Pre-order	Yes
Shipping Starts	January 2015	Christmas 2015	-
Weight	Around 140 g	-	Projector: 8.5 Kg , Wall-mount: 5.94 Kg Whiteboard: 28.1 Kg , Laser curtain: 309 g
Operating System	Android 4.4	No	No
Bluetooth	No	Yes	No
WiFi	Yes	Yes	Yes
Speaker Built-In	Yes	No	Yes
Native Resolution	854 x 480	-	1280 x 800
Screen Size	12"- 80"	-	70" -100"
Battery	built-in lithium polymer (4000 MAH, 2 hours of work)	Yes	No
Power Consumption	5V, 2.5A	-	Normal Mode: 345W ± 10% @ 110 Vac (network on) Eco-Mode: 285W ± 10% @ 110 Vac (network on) Standby Mode: ≤0.5W
Supporting Input	AV Input, HDMI Input	No	AV input ,HDMI input ,USB input , S-Video input,VGA input
Internal Memory	4G	-	2GB
External Memory	16GB SD card	SD card	32GB USB flash drive
Screen Distance	0.5-6m	1cm	0.51-0.76m
Aspect Ratio	16:9	-	16:10
Brightness	Up to 80	-	3,100 ANSI Lumens

Figure 4 Specification comparison

lumens);

x 800 that the display is clear enough even with the sunlight seeping into the classroom early in the morning. Despite this clear and high resolution, Dell Interactive Projector might not be suitable for home and personal use because value for money is less. The home user can choose the TouchPico Projector for lower price and enough resolution, which could appear at a medium/dark small room for entertainment purposes.

The second weakness is due to surface condition to guarantee a clear picture. The targeted surface for display area like a wall or an arm must be white and flat, without any protrusion or bump. The existence of any kind of surface problem makes directing laser light an incomplete process, which will reflect negatively on the sensors that is used in the detection of user hand reaction and movements on the surface. For instance, the Cicret Bracelet projects the screen on the arm, what happens when the pico projector is projected on black skin or hairy

arm. As human beings are diverse physically, the screen color will be might deferent on the white surface rather than dark one. Therefore, the black skin user will think twice and hesitate to buy a Cicret Bracelet until proven it is able to offer true color on their skin. The arm screen will also be affected by the arm hair, in which it is not practical and suitable for everyone to shave their arms to become a good screen. Also the TouchPico used the wall where must be white/light flat without any protrusion, and it is be quite difficult to find in some houses, but it avoid this problem by selling another product which called 'Interactive Table'. Dell Interactive Projector avoid this problem with its whiteboard attached with the device.

The third weakness is about providing integrated operating system. Many users prefer plug and play. The built-in Android operating system in TouchPico projector is an advantage as it enables download of any app from Google Play store. Dell Interactive Projector high price is also a disadvantage. It is the same price of a normal projector with a remote control device, wireless connected or even with wired cables connection. That device must be linked in similar WiFi and with full battery/plug on electricity avoiding the shutdown during the initiation process. The complexity of establishing the connection is a great disadvantage. The same argument is valid for Cicret Bracelet which does not have its own operating system. The same hassle exists when user wanted to transfer the mobile screen to the arm.

The last weakness is the built-in speaker in Cicret Bracelet. In the official video, when the user received a call, he connected with his device by pressing the answer button at the same time need to press the microphone speaker in order to hear the caller. This process is disturbing the user privacy, unless the answer call feature is integrated to a Bluetooth headset especially for the device.

4 CONCLUSION

In summary, the real issue faced by touch projector technology is not whether it is completely good or bad but whether the device features is comprehensive enough to meet user's expectation whether in business, education or entertainment. The value for money comparing price, surface problems, integrated operating system and built-in speaker may vary in terms of importance from one person to another. All in all, the four weakness mentioned above should be addressed accordingly because it can be the break or make for the device.

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