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Virtual Smart Phone Design Model based on Augmented Reality Technology

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Abstract

Communication is a way by which humans share their thoughts and feelings. Humans mainly use vocal communication to communicate with each other. We introduce a Virtual Smart Phone (VSP) in which all the required components are fabricated into the wearable device. The user can communicate with natural hand gestures and the internet on Virtual Smart Phone. In VSP users communicate with each other by Virtual mobile phones with the help of touch gestures, radio waves, and cloud computing technology [2]. VSP will end the physical reliance on mobile phones. VSP provides a unique interaction method to effortlessly communicate with each other in a cool and intuitive way.

Keywords: *communication, VSP, virtual, smart phone, gesture, technology, mobile phone.*

1. Introduction

Various multi-touch and gesture-based interactive systems are developing inspired by the cutting-edge arrival of sensing and display technologies. In these systems, the user can interact directly using touch and natural hand gestures. Nowadays there are lots of ways through which we can connect to the digital world. Unfortunately, most gestural and multi-touch based interactive systems are not portable and small portable devices fail to provide a distinct experience like full - sized gestural systems [2].

Figure 1. Virtual Smart Phone (source: Google)

The VSP-Virtual Smart Phone will connect the physical and virtual world using few smartphone components (like camera, speaker, mic, and projector) and Cloud Computing

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Technology over the internet within a wearable device. A VSP is a multi-touch and gesture-based interaction system which replaces the physical

smartphone devices with the virtual smartphone device on the user palm by which the user can communicate with other digital devices over the network [3]. VSP turns the human hand into a mobile phone by which the user can connect to the digital world.

2. Problem Statement

To overcome the dependency on physical smartphone devices by constructing a wearable gestural information interface that proposes hand gestures to interact with digital information augmented in the physical environment using projection devices and sensors.

VSP establishes communication and transfer of data between one human body to another human body or from one human body to digital devices or vice versa without depending on any platform [8]. The objective of the Virtual Smart Phone is to establish a connection between humans and digital devices.

3. Current technology

Currently, there are a variety of multi-touch mobile devices and research prototypes that can modify user interface by touch and hand-gestures. Most of these systems depend on the physical touch of the user's fingers and the device screen. Therefore, they do not recognize touch independent free-hand gestures [3].

Virtual Smartphone tries to make the digital aspect of human lives more intuitive. Various complex technologies are accumulated into a simple portable device. VSP is hugely based on technologies like augmented reality, gesture recognition, and computer vision-based algorithm.

Augmented Reality:

Augmented reality (AR) is an enhanced version of the real physical world that is achieved by the use of sensory modalities like visual, sound, touch, and olfactory [9][10]. Virtual Smart Phone uses the Augmented Reality concept to impose digital information over the real physical world. The surrounding of the user becomes digitally interactive with the help of Augmented Reality technology. Some of the Components used in AR technology are CPU, camera, accelerometers, GPS, and projectors [8].

Figure 2. Augmented Reality (source: Google)

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Gesture Recognition:

Gesture recognition is a type of perceptual computing user interface that allows computers to capture and interpret human gestures as commands [11]. Gesture recognition is an alternative user interface for providing real-time data to a computer. Instead of typing with keys or tapping on a touch screen, a motion sensor perceives and interprets movements as the primary source of data input. The Gesture Recognition system uses cameras, sensors, and computer vision algorithms to interpret various gestures and execute their respective commands.

Figure 3. Gesture Recognition (source: Google)

Computer Vision-Based Algorithm:

Computer vision is the field of computer science, machine learning, and artificial intelligence that focuses on replicating parts of the complexity of the human visual system and allowing computers to recognize and process objects in images and videos like humans [12]. The computer vision-based algorithm for tracking and recognizing hand gestures is based on a combination of multi-scale color feature detection, view based hierarchical hand models, and particle filtering. In every image, the detection of multistage color features is performed. Hand postures are then simultaneously identified and traced using particle filtering [3].

4. Components

The virtual Smartphone consists of both hardware and software components.

Hardware Components :

Power supply (battery), Processor Unit, RAM and ROM, Nano-SIM card slot, Sensors (Accelerometer, 16 Proximity sensor for identifying touch layer on Ar m), LED Indicator, Micro-Vibrator Motor for a vibration indicator, USB port (For charging or attaching other devices), 4 micro Projectors(like Pico Projectors), Camera to Capture Images and videos, low energy WI-FI and Bluetooth devices, GPS system, and 4 touch buttons (ON/OFF Button, sound Up/DOWN button, Snap Button) [1].

Software Components :

Augmented Reality, Gesture Recognition System, Touch-based Interaction System,

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Computer Vision-based Algorithm [3].

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Figure 4. Components in the virtual smartphone (source: Google)

5. Proposed Model

VSP consist of the following steps:

1-Enabling and Authenticating VSP

2-Call Making

3-Call Receiving

4-Image and Video Capturing

5-Data Transfer

i. Enabling and Authenticating VSP:

The user can switch on/off their VSP device by the power button key. If the user has already logged in, then the status of the user will be displayed on the screen otherwise the user will be given options to sign up or log-in to the device by username/password, pattern, pin, face recognition, fingerprint scanner, or palm-line detection [8]. After the user has signed in VSP will be ready to perform other functions.

ii. Call Making:

After enabling VSP, the user will be able to make calls to their contacts. The user can dial contact numbers by typing from a virtual keypad or use a voice-recognition system [2]. The following two methods are used to establish a call connection between two users.

A] CALL USING SIM:

The VSP device provides a micro SIM card slot by which the user can communicate through GSM/CDMA (Global System for Mobile communication / Code Division Multiple Access) Technology [1].

B] CALL USING VOIP:

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VSP device has features like WIFI and mobile data by which the user can connect to the internet. Using this technique the user can make calls using VOIP(Voice Over Internet Protocol) technology (like Whatsapp call in smartphones). Using VOIP technology, the user can call other VSP users, as well as all other VOIP and GSM enabled digital devices [3]. VOIP technique is only applicable when the VSP device is connected to the internet otherwise VSP will use the SIM technique as default.

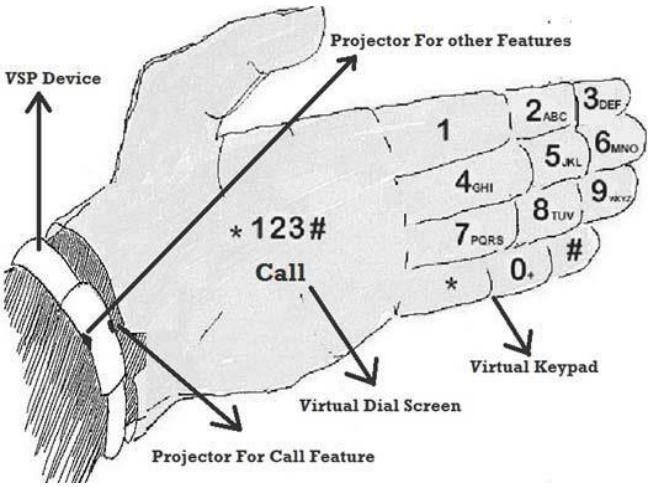

Figure 5. VSP call keypad-1 [2]

Figure 6. VSP call keypad-2 (source: Google)

iii. Call Receiving:

When a VSP user is called by another VSP user or any other device(physical mobile phone, laptop, PC), the VSP shows an incoming call screen to the user on their palm, wrist, or forearm(depends on the user settings) using a projector.

The VSP will follow the device sound-profile setting and act accordingly. If the device is in the silent mode, then VSP will only show the call screen, if the device is in vibrate mode, then VSP will use the vibrator motor to indicate the incoming call alongside the call screen, and if the device is in sound mode, then the call r ingtone

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will be played by speakers combined with the vibration and the call screen. For

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communicating after accepting the call, the user can use a built-in mic and speakers, Bluetooth headsets, or wired headsets [8].

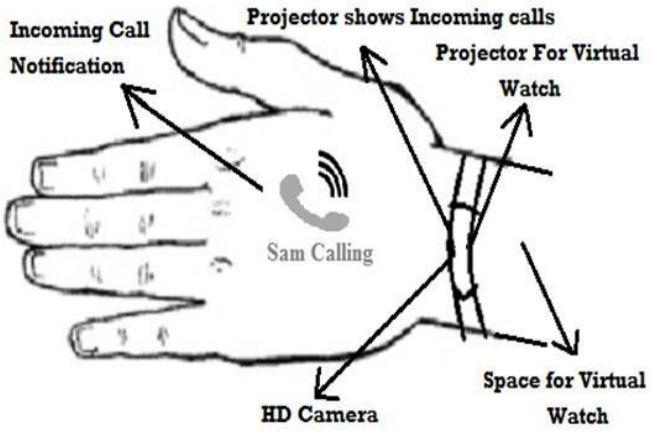

Figure 7. VSP call Receiving-1 [2]

Figure 8. VSP call Receiving-2 (source: Google)

iv. Image/Video capturing:
VSP can capture images and videos using a built-in HD camera. The user will normally have to open the camera app and click on the capture button to capture a photo. The user can switch to video mode to shoot videos. The user can zoom in/out using gestures or volume up/down buttons.

v. Data Transfer:
Alongside the current data transfer techniques like Bluetooth, WIFI-Hotspot connection, the VSP can also transfer data using cloud technology. The internet is required to use a cloud data transfer technique. VSP users who wish to send data can copy or upload their data on their unique cloud space with a unique id. VSP users who wish to receive data can paste or download the data from assigned cloud space by the sender VSP user [3].

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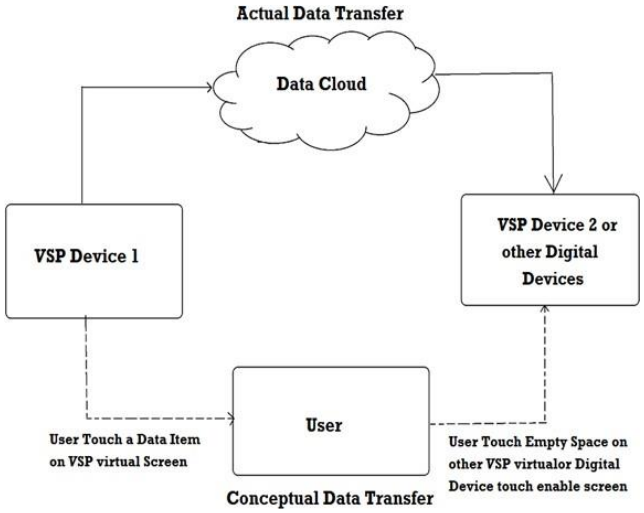

Figure 9. VSP Data Transfer-1 [2]

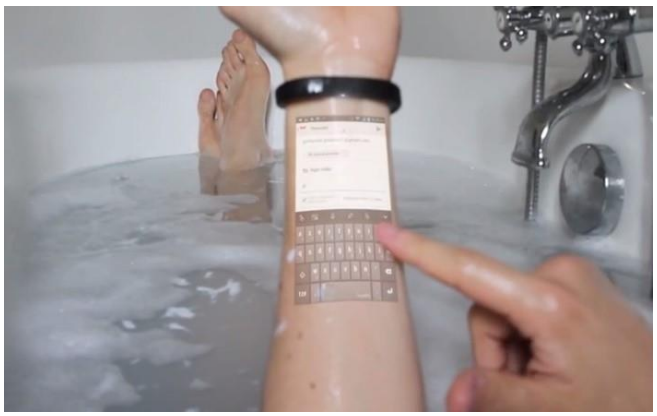

Figure 10. VSP Data Transfer-2 (source: Google)

6. Future Scope

VSP is the first step towards building a bridge between the physical and the virtual world. VSP will end dependency on physical mobile devices. Besides the technical benefits of VSP, there are also real-world applications of VSP like Health Monitoring System, Education and Training System, Virtual Devices Connections, Communication, Data Transfer, Global Current Updates, and many more [8].

VSP Advantages:

Time-Saving **-** There is no need for a physical meeting to communicate. VSP applications allow users to pass across whatever data that they have from wherever they are. This eventually saves time.

Money-Saving **-** Another advantage of VSP is that the users can reduce the transport expenses of employees. Companies cut on operational costs of employees, thus saving more money to be used on other functions.

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Convenient - People or employees can interact with each other from wherever they are. They do not have to meet in person. This reduces frustration, especially when they are busy or caught up in traffic.

Handy(Portable) **–** The VSP is a very small hardware device that the user can wear everywhere without any extra effort.

Simple and Smart – The user interface of the VSP will be similar to the current smartphones hence easy to use.

Fast - VSP takes a negligible amount of time to perform a task or connect with the other person. It is always a few touches away.

Secure **–** VSP uses up-to-date security techniques to secure the user's device.

7. Conclusion

VSP is a wearable, multi-touch, and gesture-based interaction system that proposes hand gestures to interact with digital information augmented in the physical environment using projection devices and sensors. Physical dependency on mobile phones will end as VSP can perform all tasks of physical mobile phones. In the future VSP will be used for Health Monitoring System, Education and Training System, and many more such applications.

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