Most Flexible Human Computer Interactions Using Surface Computing Technology

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Abstract: Surface computing introduces multi touch technology which is multi figure and multi user interface which is dancing around computer science since last few decades. In this technology computer vision is created by series of infrared cameras are installed in it. It has a lot of wireless cameras which is built in it surface computing platform. Now it is being used in commercial purpose in hotels, casinos. It can be used by gestures. The main functions of this technology is direct interaction, multi touch interaction, multi user experience and object recognition. In this paper a critical review has been presented about the surface computing technology which is an unusual forum of human computer interactions.

Keywords: Surface; computing; multi touch; wireless cameras

I. INTRODUCTION

With the passage of time technology is shifting gears and use of technology is becoming easier and easier Surface computing is new paradigm in computing. It is user friendly computer which facilitate the user to use computer without relying on other devices like mouse, keyboard.

Its display just looks like a coffee table or carom board with 30 inch wide screen with three dimensional images [6]. This is complete revolution in computing because keyboard was in since many years as it was modified form of type writer which was not much significant change with respect to surface. It can be used by people who do not know much computing. It can be easily used separately in group of four to five persons at a same time and share information with each other multi use helps to communicate easily which will not affect the efficiency of machine. Temperature of the room can also be easily measured. Windows vista is installed in it and its rear projection of five cameras which is installed in it will recognize all the objects on the surface. Its modern applications allows to get any kind of information by a simple touch .it's just like a communication machine in which any kind of information can be easily transferred by touching and grabbing. Music player or music files can be easily dragged around between two devices.

Digital pictures can be easily resized and can be easily moved around table by using fingers. Two opposite corners of the picture can be grabbed and will be enlarged. Pictures can be transferred by placing digital cameras on the top by wireless connection. These can easily drag around just by using fingers.

Computing session can be shared by this yechnology.fve cameras are install physical appearance on screen. It has 30 inch table laptop display. It is simple, it is convenient and social. A person doesn't have to know computing for using this. Icons and application will be displayed in front of a user and users have to only select that by touching it. In other words it is a user friendly computer. It provides the facility to the user to use that as a piece of paper and allow zooming in and zooming out. Different type of business applications and health care applications are installed. Normal finger processor and simple graphing card is installed in it. It is developed by software.

It has four specifications which includes direct interaction, multi touch, multi-user and object recognition**.**

A. Direct Interaction:

It allows the direct interaction of finger or any other object without depending on other devices. [1]It can be easily used by person who doesn't know computing.

B. Multi User Experience

More than one person at a single time can interact with the computer separately. It allows face to face interaction of differently users at a single time sitting around one table.

C. Multi Touch

Microsoft surface will respond to multiple touches at a single time [5]. Its capability is to reply 52 touches at same time.

D. How It Will Recognize Multi Touch

Multi touch is implemented on the basis of size and interface type. Image is projected through glass and it is back lighted with led. When surface will be touched by finger its reflection will be caught and will be sent to software which will recognizes the object or finger and will response. [7, 8]

E. Object Recognition

Physical objects can be easily recognized when placed on the screen. It can easily recognize the person with their finger print. For this purpose this is being used in hostels for recognizing their customers through membership card.
Data can be easily shared by putting digital device on the table top.
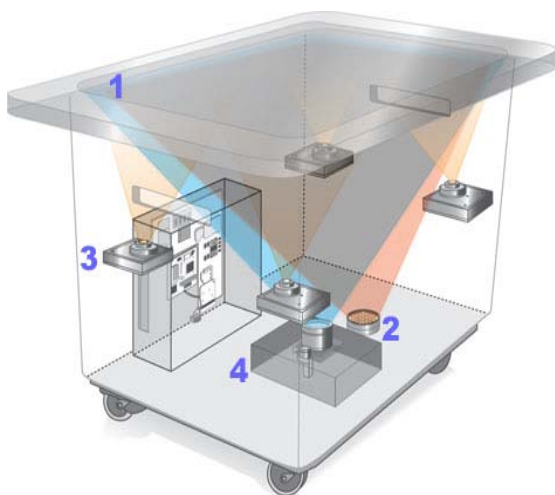

Figure.1 internal structure of Microsoft surface

II. MICROSOFT SURFACE ARCHITECTURE

The architecture of the Microsoft surface is supposed to consists of screen, infrared, CPU and the projector. These four parts of a device that is composed of the Microsoft technology makes the use of new functions that are only imaginable for a normal person just like nearly a century ago the computer was unimaginable for the people.

A. Screen

The Screen is the first aspect to be discussed in the architecture of Microsoft surface. Screen of other computing devices are used to show the output and the working of the processes that are running. But the Microsoft surface technology makes use of screen as both for input and output, just like the touch screen technology that is now-a-days been used in mobiles, iPods and other computing devices. The chemistry of diffusion process is taken for the purposes that are responsible for display at every single part of screen. The diffusion also makes the touch screen technology enabled at the device that is been used.

B. Infrared

The second part of the architecture of the Microsoft technology is known as infrared. Infrared in mobiles is very much familiar technology and even in villages where the mobile companies are providing there network the people are well aware of it. [2]This infrared has an important role in providing the touch screen technology and some other functions of the Microsoft surface.

An LED is present behind the screen. The range of LED depends on the purpose for which the device is being used. In simple words one can say for a packet size device composed of Microsoft technology the LED will be off course different when compared to the device that is been made for the purpose of presenting lectures in united nations conferences.

When the screen of the device is touched the light present behind it are disturbed and the functionality of touch screen is started.[3] The light moves at different corners and for each and every corner a function has been made to work and generate outputs.

Figure.2 musical application of Microsoft surface

The simple figure is showing the Microsoft surface technology been used with fingers and the light is been placed in the wall as one can easily see.

There are several cameras installed there for taking use of light and they are designed especially for the working of the infrared [4]. The number of cameras depends on the requirement similar to the range of LED's. The working of those cameras is quite similar to the optical mouse.

C.   CPU

The third main feature of the Microsoft surface is the CPU installed inside the computing device. Its processor is dependent on the environment for been which it has to work for. The CPU has RAM present for the use of Microsoft surface, that RAM could be upgraded easily to make it efficient and up to date. Also a graphics card is attached inside for the colorful layer of lights. Wi-Fi and Bluetooth are also been used here in Microsoft surface technology for dealing with the electric signals emitted by the movement of light.

The CPU is the important part of the device as all the working is programmed and controlled by it. It is intelligent and can manage the whole of device. Also the speed of the functionality of the device been used if very much dependent on the CPU. How fast it detects and processes the movement of lights and generates the specific output for the function to perform.
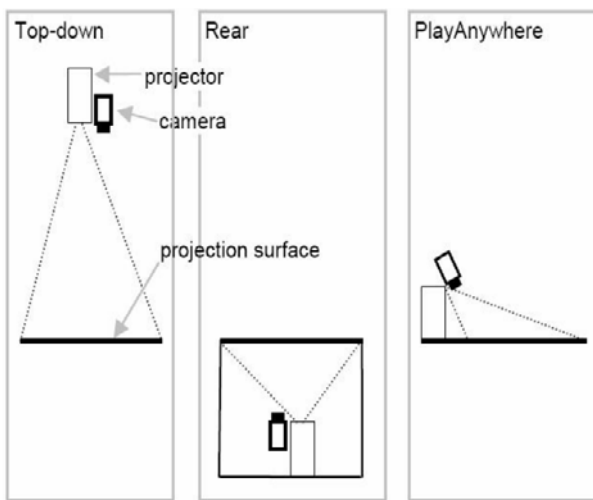

Figure.3 design and working of its projector

One can see that the Microsoft surface technology has been shown in the above picture.

D.   Projector

The last part of the Microsoft architecture is the Projector that is currently been used in the HDTV's. Its working is to process the lights inside the device and transfer those to the CPU to take action as it has been programmed.

The surface now-a-days present is designed in such a architecture that it has the ability to take action against fifty four touches at the same time without any break. This is a very huge achievement done by its developers and the engineers.

The great feature is that yet it is the not the end and still a lot of improvement and up gradation in its architecture is expect and one can have a thought that after fifteen to twenty years this technology can become common in every house and its ability to respond can be increased to fifty four thousands as the computing technology is progressing in such a rapid and fast way that nearly nothing is impossible to happen in the centuries to come.

Today the disadvantage that the architecture of Microsoft surface technology has is that the electric signals greatly affect its users in worst way. So the challenge will be

to reduce the hazards and the disadvantages of surface will be some great changes in the architecture of the Microsoft surface that is much and more friendly and is not harmful to the people using it.

T-mobile company of USA is using surface technology in stores for displaying their products. It facilitates the customer for comparing two different cell phones their features applications and their pieces. By this advanced technology small store are being turned into a big stores where customers have the surety of getting information about variety of things in their own manner. Coverage of 2008 American presidential elections was examined through surface technology.

III.   APPLICATION OF MICROSOFT

A.   Microsoft Surface Concierge

This application facilitates the companies for impressive display of maps. Specific locations are being highlighted by it which provides attraction to the viewers.

B.   Business Benefits

In business it will be very use full as many persons can sit around it and open one file or image and can discuss it.

C.   Microsoft Surface Photo:

Photos can be shared easily by placing camera on the top. These photos can be grabbed and enlarged by easily.

D.   Microsoft Surface Music

Music files can also be sent or received just by a touch. These can be easily transferred to other devices with modern applications music can also be created.

E.   Microsoft Surface Water

This application is just like screen saver but it really gives the effect of water and attract the user to touch it and feel it. Touch will be responded by drawing the ripples and producing the sound of water. It will feel the effect when some other object will be placed on it.

Figure.4 real water effect of Microsoft surface
(#Figure Source: file:///E:/se%205/paper/pics/imgres%20(8).htm)

F.   Sample Applications

Following games can be easily played on it by giving the real effect to the user.

G. Checkers

On surface it's just look like a real board .size of the board can be adjusted and will be locked after adjusting. it teaches for the wrong move by following the rules. if anyone want to play freely without any rule so this can also be done. Pieces can be moved freely and can be thrown and scattered. Board can also be reset rules will be on and difficulty level can also be settled.

H. Chess

Check is fundamentally similar to checkers so its rules are harder and artificial intelligence is little bit advanced. This game is fully customized and teaches more than checker if wrong move has been taken place it gives all the possibilities of move.

Ribbon is not actually a game put it just like drawing ribbons on the surface. Anything can be written on it will be just look like a ribbons. It is just a sample paint application.
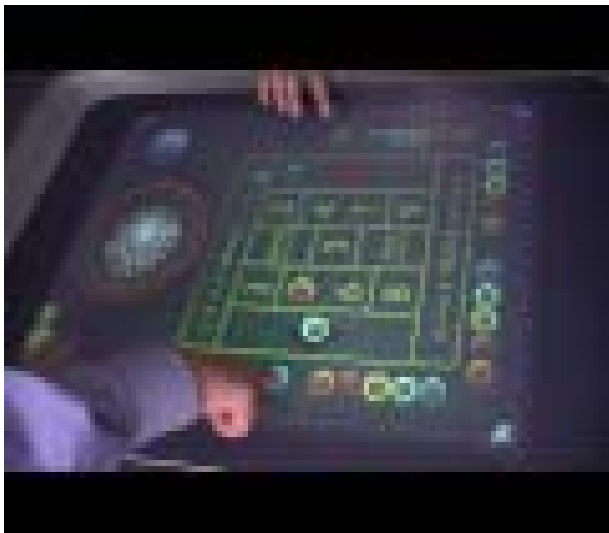
I. Casino

Figure .5 Microsoft surface is converted into casino table

In hotels it is used for playing casinos as this table top is automatically converted into casino board and five to six users can play this.

J. Financial Service Application

This is used in banking service it guides the customer how to invest their money by showing them interactive graphs videos and other relevant details. It facilitate in opening accounts in banks and financial planning.

K. After Mouse Effect

Surface computing gives us the chance to get rid of mouse it is the initial step to the philosophy doesn't make me think. Person doesn't have to rely on other things and other options as everything will be displayed in front of him including its photos and videos.

This is a technique for going beyond the mouse effect. If there is a competition of painting of small kindergarten children's there will be three possibilities for them.

a. to use natural effect

b. to use computer
c. to use surface computer

L. Typical Painting Technique

For simple method of painting paint board with all the equipment of painting like(colors, different brushes, paint remover etc)will be required. for doing painting they must know how to handle the equipments and how to make use of them at a proper time so most of them would not be to paint due to lack of practice but may be they have better plan in their mind for paint put they cannot express their built in ability and quality. These barriers will not allow them to express their ability.

M. Painting Using Computer

But if computer should be provided to them instead of manual paint we will have to provide them number of computers and the children who are taking part in competition now computing and also in painting they will have to rely on Mouse for painting and if they cannot handle mouse properly they could not paint properly and for selecting some option they will have to right click on them to use and then add some of context.

So if mouse is a barrier in their way to express their art and the feelings. So child who is supposed to take part in painting competition will first know computing and how to paint on computer. Children cannot properly read or manage the menu bar, paint application that are been used in the computers

IV. USE OF SURFACE

The third option which one have is to use its own surface computer in which neither the barrier of knowing computer will be used where neither the barrier of familiar with computing will be there nor familiar with paint brushes or these equipment will be there. Issue of quantity of computer will also be not included. Four to five students can easily be accommodated on one computer. Using surface as it is very close to reality so videos and images of those scenarios will be shown to them and it will be very easy for them to catch and to paint it. Surface will be easily converted into paint board and it will be very easy for them to use it rather depending on mouse and other accessories child who have never painted in reality can easily paint by using all the options which will be provided to them through modern applications.

Real brushes and paint accessories can also be used in surface by drawing the with these equipments on the surface will give the real effect of painting on the board as its table top will be automatically converted into board.

So surface will include every type of facility of the past time and some things are also included in it.

Figure.6 painting application of Microsoft surface which can be done using hands or other thing
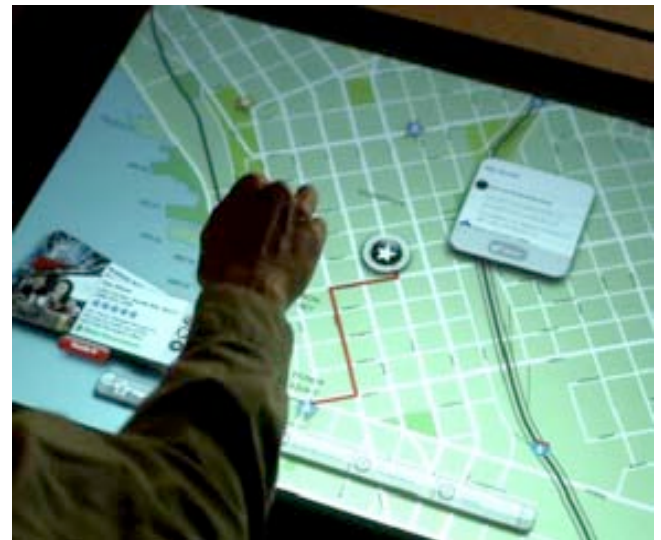(#Figure Source: file:///E:/se%205/paper/pics/imgres%20(3).htm)

Figure .7any place can be easily viewed with its all details and especially movement of cops can be easily viewed using falcon eye application
(#Figure Source: http://blogs.msdn.com/b/bill/archive/2007/05/30/microsoft-surface.aspx)

A.   *Falcon Eye*

In this application this application allows to manipulate the map easily on the surface and can view any of the places in wprld.map can be moved or twisted and rotated easily by a simple touch. This can be easily zoon in and zoon out easily. Anything on the map can be easily zoom in and zoom out to particular area. By zooming in to certain area if we want to know about the power consumption of that area which will be easily displayed on the screen in similar way it will tell about the temperature of the specific area located in the map as well as crime rate

B.   *Police*

This application will be very use full for the police to control and know about everything by simple sitting in the control room.

An officer sitting in the control room can easily know about the persons and locations of the map. Officer will be easily known which area need the more police force or which area needs the less police force they can make the planning easily. The zooming in through map on one soldier his all the information will be displayed on the surface.
It will be very helpful for the officers to view the performance of cops that how they respond in emergency case tactic planning can be easily done by officers by SD viewing. Location of the units can be easily identified and their actions can be viewed easily.

This application is also very useful for the traffic police they can easily visit some area and where cameras are installed videos of those places can be easily inspected. There is problem of traffic in some area like traffic block due to accident or due to some other reason will be displayed and they can change the route of others car coming from the back and send them to other path.

C.   *Oil and Gas*

this application is also very useful for the oil and gas department because they can easily view the site through surface and can be easily know about the situation of oil and gas in that area. for example a person sitting in new York can easily view the image in Dubai through and know about the situation of oil and gas in the area.

D.   *Building Construction*

Building construction can be easily examined by sitting in other area and can also be inspected by the officials.
One engineer can guide many of the constructors through surface at a single time because he can view his site easily and if cameras will be installed at the site than he can see the construction live just by sitting in his room.
Plans will be easily discussed through and performance will also be seen.

This technology allows the government to navigate the data of real time through its 3d effects. Data will be automatically streamed without refreshing it. Automatic updates will be provided and collection of data is easy.

E.   *Constructing and Buying Home*

It really helps the customer to built or buy the home just by sitting in room by online survey with the modern applications of after mouse. By using these applications a person can easily visit the house or apartment just by sitting around the coffee table.

In constructing the home the site can be visited the paint of the walls can be selected by just a little touch and design of the floor and other things can be selected as these things are stored in computer.

It really brings ease to real estate business for buying and selling the home easily just sitting around one table.

Figure 8 changes can be made on construction site by sitting in home
(#Figure Source: file:///E:/se%205/paper/pics/imgres%20(5).htm)

Any place can be visited by surface by using 3d projection as they can visit any place which he want to buy will give the effect as the person is really present at that place. He can also visit its surrounding and mountains, hills, schools, atmosphere and other places just by using this application.

F.   Use in Health Care Department

Surgeons are being facilitated by its lacroscopic surgery. Doctor can examine the patient through surface by watching the images of x ray report, CT scan, lab results direct conversation with doctor will allow them to check the patient online. Patient will easily tell his problem through his gestures and by pointing his body part where he is feeling pain.

G.   Advantages in Educational Department

Modern computers provide multiple applications in multiple windows but they allow one person at one time to use it and equipped with mouse and keyboard. But surface attract students because it facilitates to issue task in one place with modern applications.

It encourages the student to work in the form of team or group with each other and it increases the team work skills [9]. With the modern technique of software and hardware it helps the students to make their assignments and also get the help from teachers at the same time. Students sitting in the group are facilitated are facilitated by it can open a file easily, drag it, modify it create it and delete it and save the files. They can edit the file easily. [9] Pictures can be shared, modified, add and remove easily in photography class. Difference of painting and drawing within finger can be easily recognized. It offers vary interactive way of learning like the convention interface such as the pathetic excel outlook. It offers direct interaction with that make learning very interactive and effective. Specific locations of the map can be easily find with the help of its application falcon eye which allows to visit or zoon in any location. [9] Computer lab operators can easily accommodate the students by occupying less space job can be easily

conducted and research work can be handled easily. Students can easily transfer the data which is related to their research or other information. School system will be improved by intruding surface in that area. Quiz will be sent to student desktop and than can be checked automatically. It introduces the trend of modern paper invigilation and checking system through artificial intelligence as student desktop will be easily examined by the teacher. With the communication setup between students and teachers table top will ease the teacher to help every student by coming on his level or to help student separately at that point in which he or she lacks. The need of print out and photo copy will be automatically eliminated as teacher have the facility to send notes or assignments to every desktop or to those which needs those notes. Teacher can guide or warns any student easily during class activity by sending him notes through IM system of chat.

If problem occurs on surface student can join the other table and start his own work without disturbing or can join him. The knowledge and level of the students will be increased by showing the videos and pictures of the relevant lectures or by giving the example from daily life routine through surface. By this percentage of those will be increased to whom lecture will be cleared. Making of assignments and projects will be easier by engaging the students to work one desktop together. Students will have the better chance to interact with other students of their level easily or to help those who understand them better as compare to teachers.

H.   Benefits' In Real Life

It eliminates all the boundaries with the students or group of people to work together and they get support and learning from each other by sitting at different places [9]. It develops the feeling to be in contact with other peoples of other culture or tradition and increase the global awareness by communicating with culture or tradition of the other people. Variety of media and formats allow to communicate easily with group of audience and attract them to develop interest in it [9]

It attracts to work with the people of same standards or having equal caliber or other who are engage with them through global environment.

I.   Disadvantages in Schooling

This technology is very expansive and it's competing in the market to find its place as this table has the ability to acquire more than one student at a time the privacy will be the issue as the work of every one will be previewed easily. As this technology is unreliable so if problem occurs in any application it will create the problem for every student in class. [9]

Microsoft is not selling its hardware so if some problem occurs in it than hardware could not be changed.

J.   Surface Being Used In Hotels

In hotels person is recognize by VIP card when it is placed on surface than the entire menu is displayed in front of him. It enables four people at same time to select their meal or cocktail, wine or any other thing. Customer can select his own tray with the dishes he want, fotos, prices and other descriptions are displayed and it requires touch to order any of thing. It provides information about all wines and their characteristics just like as in real life.

Objects will be easily recognized on it for example if person want to order a wine all wines which are available can be displayed with all its specifications. And different wines can be easily compared with each including their prices and ingredients'. And it will be very easy for the customer to choose the wine.

Its object recognition quality will engage the customers in re ordering the drinks. If person is drinking a wine and he has dunked that and if he wants more he will just simply put his glass on the coffee table and waiters will able to know about his need and will bring more. Hotel reservation can easily do by transferring the mapping information and location of the hotel with surface computing by sitting in home. Hurrahs hotel is using this technique where guest of the bar can chat easily and guests are eased to order their dishes through surface and using this they can chat with other guests in the bar. Bills will be paid easily in hotels by just dropping the credit card on the surface

K.   *Future Approach in Schooling*

In future the wooden desks of the students will be replaced by the surface table top. Every student desk will be equipped with the surface computer in will ease the students rather bringing their heavy bags and books. Teacher on the front will also be equipped with the surface and he can easily see what other students are doing and he can even teach them individually or in the form of group.

L.   *Future Approach in Hospitality*

Patients will be examined online through the surface. They will be checked and diagnosed through the surface. Multiple images of the patients will be manipulated quickly and with 3d models it will have faster processing and will be diagnosed easily. Online operation system will be launched.

V.   CONCLUSION

Surface computing is a step toward the next generation computing. The traditional input output devices are being eliminated and user is offered direct interaction with the application .the application of the surface computing are restricted just where the presence of computer is precisely

everywhere. The surface computing offered reduction in undergoing interaction from user end to computers. Eventually   state of the art interaction between humans and computer appeared. Its applications in defense gaming and the medical field had revolutionized the impact of computing in facilitating. The humans and has redefined the domains of the mentioned fields. In the defense field applications of surface computing had reduce the crucial time wasted in interacting with the computer using traditional input output devices along with a detailed and a non ambiguous details .such features yielded better output that enhanced the military tactics to new heights .

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