

No-Touch Interface in ICT for Prosperous Rural Development

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ABSTRACT

It is observed that there is a tremendous change in computer hardware and software. Simultaneously there was a change in types and devices of input and outputs for computers. As far as input to computer is concern, it was started from punched cards, then magnetic tapes and so on up to touch screen and voice input. The same case is happened with output of computer. At the beginning it was just information (Processed data). It might be in text or image formats. But now a days the output of computer is everywhere in the world (Directly or indirectly it is related with computers). Here I want to introduce “no-touch interface” of computer for “rural development”. This research is not just descriptive or analytical research or survey. Here I want to suggest a solution for immediate problems facing a rural area of the India and world. So I will say this is applied research and somewhat it is laboratory research. I want to discuss role of “No-Touch Interface” of ICT in Rural Development. I will consider three major areas,

1. Information retrieval and communication in local languages
2. Automation in Agriculture and logistics
3. Role of Artificial Intelligence in quality control of agriculture products

In this paper, I will concentrate on 6 major applications to fulfill the above needs

1. Role of GPS and GIS in cultivation, transportation (Driverless tractors, sprayers, cultivators and vehicles)
2. Role of Sensors, Cameras and microcontrollers in horticulture and floriculture
3. New Cloud to forecast the agricultural production.
4. Weather forecasting and planning
5. Automation in Disease detection, security, fertilizer and water management
6. Local Language (Voice) interface, Speech Recognition, TTS, Speech Synthesis

Key words: GPS, GIS, ICT, No-Touch Interface, Rural Development

Introduction

We are observing the tremendous change in computer hardware and software day by day. Simultaneously there was a change in media of input and outputs for computers. As far as input to computer is concern, it was started from punched cards, then magnetic tapes and so on up to touch screen and voice input.

The same case is happened with output of computer. At the beginning it was just information (Processed data). It might be in text or image formats. But now a days the output of computer is everywhere in the world (Directly or indirectly it is related with computers).

Here I want to introduce “no-touch interface” of computer for “rural development”. This research is not just descriptive or analytical research or survey.

Here I want to suggest a solution for immediate problems facing a rural area across the world. So I will say that this is applied research and somewhat it is laboratory research.

No-Touch Interface

There are five senses for human being Hearing, Sight, Touch, Taste and Smell. Out of that we are using only one touch sense for communication with PCs. This No-touch interface is nothing but to develop new media of communication excluding touch sense. That means hearing, sight, Taste and smell. Out of these four first two (hearing and sight) are in progress. Hearing can be done with speech recognition and sight can be implemented with high resolution cameras (2D and 3D) and image processing. Rest of the two (Taste and smell) are the opportunities for upcoming developers.

The main objective of the paper is to study “How the progress of digitization is growing from touch to no-touch technology”. It will include the GPS, GIS technologies, Audio and Image processing, Artificial Intelligence, role of different sensors in different gadgets (like cars, Tractors, Robot), Micro Controllers etc

I will consider three major areas,

1. Information retrieval and communication in local languages without touch sense
2. Automation in Agriculture and e-logistics
3. Role of Artificial Intelligence in quality control of agriculture products

In this paper, I will concentrate on 6 major applications to fulfill the above needs

1. Role of Sensors, Cameras and microcontrollers in agriculture
2. Role of GPS and GIS in cultivation, transportation (Driverless tractors, sprayers, cultivators and vehicles)
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No-Touch Applications for Prosperous Rural India

Role of Sensors, Cameras, Voice and microcontrollers in horticulture and floriculture

The basic pattern recognition technology has been advancing for generations, we can expect computer interfaces to become almost indistinguishable from humans in little more than a decade.

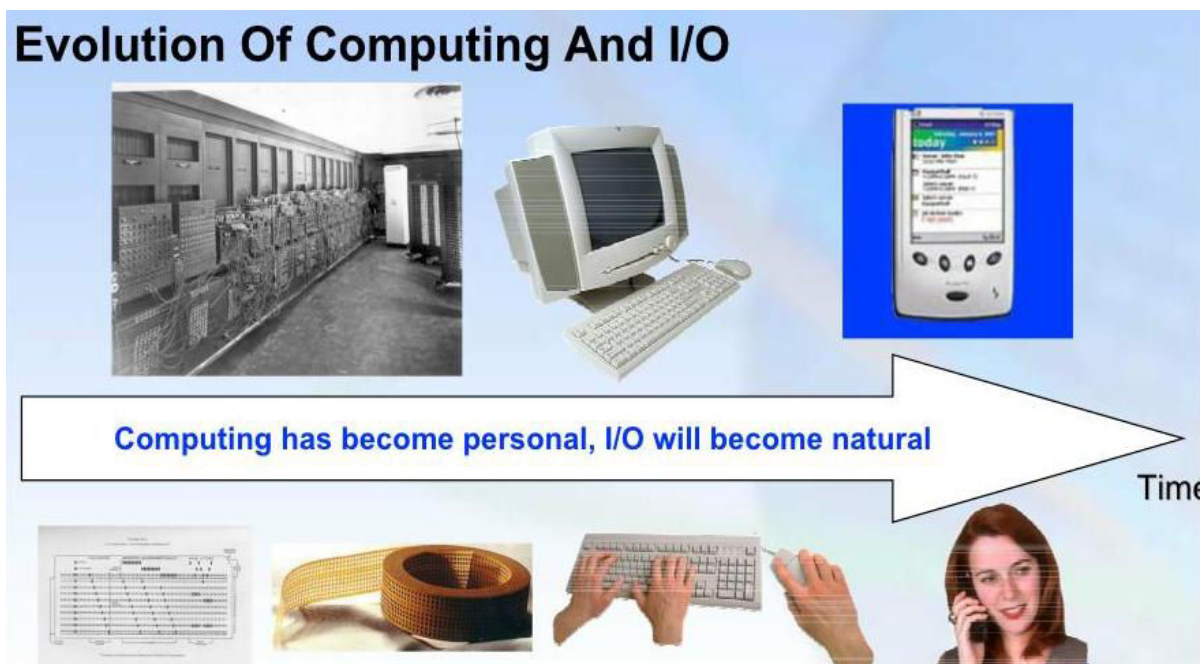


Figure 1: Showing Growth of Computer Input/output Devices and Hardware

(recent-trends-no-touch-interfaces.html , 2013)With advances in sensors and cameras, no-touch interfaces and devices will continue to be further integrated into daily life. Smart phones such as the Pantech Perception and the upcoming Samsung Galaxy S4 are the latest devices to incorporate touchless features, with each device enabling users to browse through picture galleries or answer a phone call by just waving a hand over the smartphone screen. The Galaxy S4 also has Smart Scroll, which detects eyes and scrolls web pages based on the angle the user tilts his or her head.

Many smartphone users are already familiar with no-touch technology. Obviously the credit goes to the wide adoption of voice recognition software in wireless devices. Smartphone users use apps like Google Now on Android and Siri on iOS for hands-free access to endless information. And now, Google Chrome has added voice recognition to its latest version,

enabling features like email dictation. This technology is also being incorporated into automobiles to allow for a hands-free mobile experience for drivers.

Gesture technology is also featured in products like Kinect for Xbox. To expand this functionality to computers, Kinect for Windows was created and uses software and sensors. One app for Kinect for Windows allows surgeons to use gestures to control medical images and scans on computers, eliminating time lost when using unsterilized computers then having to scrub up again. Intel has developed a gesture-sensing device using conventional and infrared cameras, microphones and software to enable apps on computers to track a person's fingers, recognize faces, infer emotions and interpret words spoken in nine languages. However, this is just the beginning. Mobile voice interfaces will soon be even more commonplace allowing users to talk to a device without touching it first.

Algorithm behind No-Touch (recent-trends-no-touch-interfaces.html , 2013) A simple user interface for Touchless control of electrically operated equipment. Unlike other systems which depend on distance to the sensor or sensor selection this system depends on hand and or finger motions, a hand wave in a certain direction, or a flick of the hand in one area, or holding the hand in one area or pointing with one finger for example. The device is based on optical pattern recognition using a solid state optical matrix sensor with a lens to detect hand motions. This sensor is then connected to a digital image processor, which interprets the patterns of motion and outputs the results as signals to control fixtures, appliances, machinery, or any device controllable through electrical signals

These features of sensors, cameras and voice inputs can be applied in agricultural applications for security purpose, Sensors for fire detection, checking temperature and humidity level, operating many electrical devices automatically.

Touch less Monitor (recent-trends-no-touch-interfaces.html , 2013)

(recent-trends-no-touch-interfaces.html , 2013) Surely, almost all peoples are using touch-screen interfaces these days, but this is the first time I am writing about a monitor that can respond to gestures without actually having to touch the screen. ^[1]The monitor, based on technology from TouchKo was recently demonstrated by White Electronic Designs and Tactyl Services at the CeBIT show. Designed for applications where touch may be difficult, such as for doctors who might be wearing surgical gloves, the display features capacitive sensors that can read movements from up to 15cm away from the screen. Software can then translate gestures into screen commands.

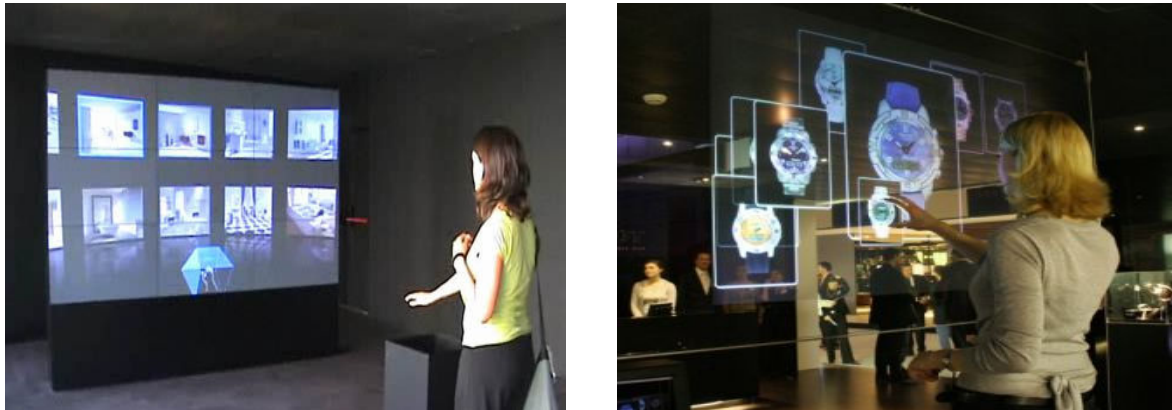


Figure 2: Touchscreen Interfaces

Touchscreen interfaces are great, but all that touching, like foreplay, can be a little bit of a drag. Enter the wonder kids from Elliptic Labs, who are hard at work on implementing a touchless interface. The input method is, well, in thin air. The technology detects motion in 3D and requires no special worn-sensors for operation. By simply pointing at the screen, users can manipulate the object being displayed in 3D.

Role of GPS and GIS in cultivation, transportation (Driverless tractors, sprayers, cultivators and vehicles) (p169.html, 2013)

(p169.html, 2013) Global positioning system (GPS) technology has complimented geographic information systems (GISs) for a number of years and is now well understood and accepted by the GIS community. The primary focus of GPS within the GIS arena has traditionally been based around GPS systems that collect, store and transfer data from a field system to an office-based GIS. With current developments in field computers (especially related to lightweight and low cost devices that operate Microsoft's Windows CE operating system) there is a strong desire to take GIS directly into the field. This is becoming most important touch less communication medium. (E.g. Driverless Car developed by Google)

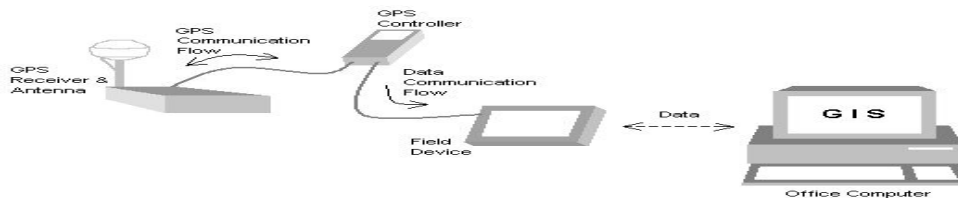


Figure 3: GIS and GPS System

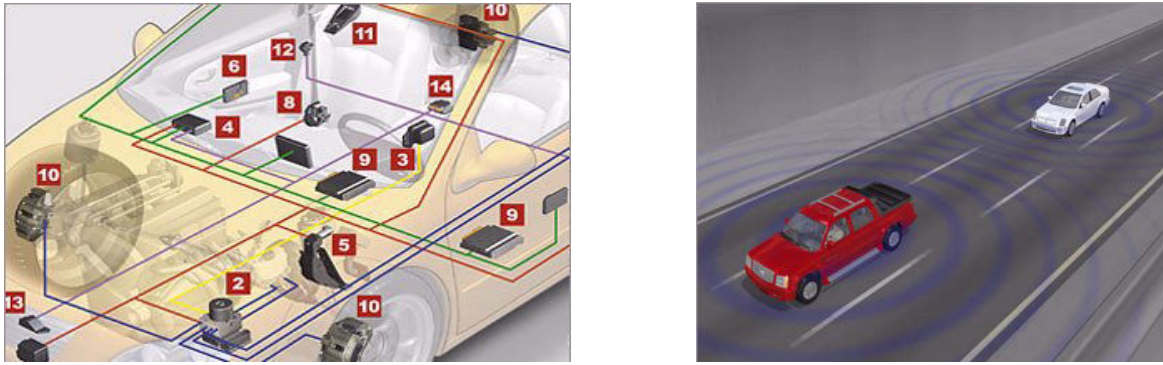


Figure 4: Driverless Car Invented by Google
Proposed Design for Driverless Tractor (Users View)



Figure 5: Snapshot by Google Map to Mark the Work Location

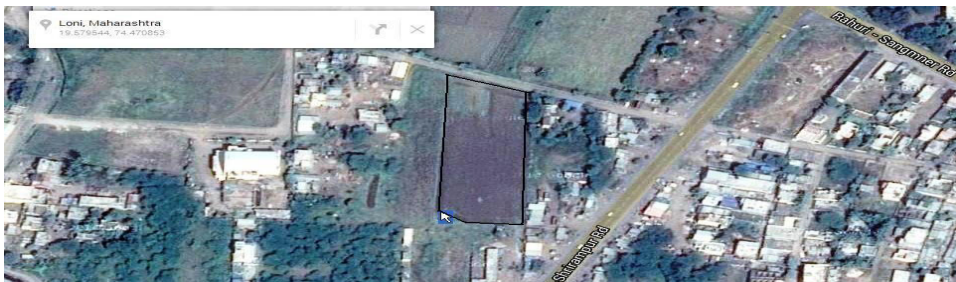


Figure 6: The Marked Portion for Proposed Work

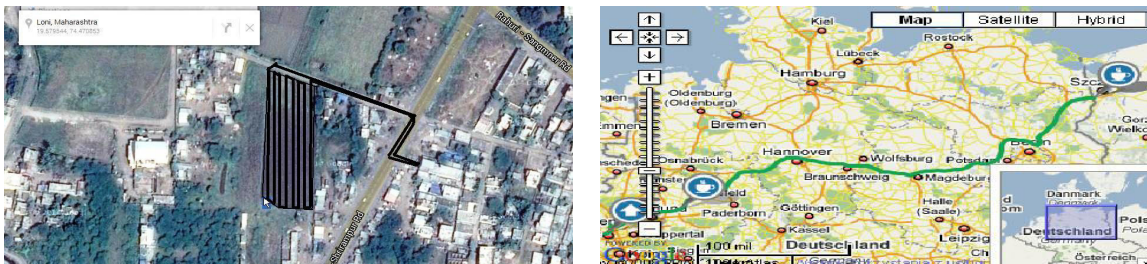


Figure 7: Worked Area and path of Tractor and Path Tracker Already Exist in Android

Using Computer Technology in Agricultural Laboratories and Medical Field (Which Can Use Touch Less Communication)

(Major areas for agri. Automation is in Disease detection, security, fertilizer and water management)

The different types of monitoring equipment in Laboratories are often based on computer programming. These equipments can be used in Agriculture and Rural areas.

Imaging technique (importance-of-computers-in-medicine.html , 2013)

Medical imaging deals with techniques to create images of the human body for medical purposes. Many of the modern methods of scanning and imaging are largely based on computer technology. We have been able to implement many of the advanced medical imaging techniques.

The same imaging techniques can be used in disease detection for crops and plants. We can compare standard Leaf of that plant with infected Leaf. This algorithm can consider

1. Holes or spots on leaf, color of spot
2. Intensity of changed Color of leaf and its color (Gray/white/green)
3. Shape of Leaf
4. Size of leaf

3D Image scanning (TOMOGRAPHY)

Computed tomography makes use of digital geometry processing techniques to obtain 3-D images. Sophisticated computers and infrared cameras are used for obtaining high-resolution images. Computers are widely used for the generation of 3-D images.

This tomography is more useful in agriculture for various purposes like, security, Supervision, Dairy Farms, Insects detection in horticulture gardens.

Many of the modern-day medical equipment have small, programmed computers. Many of the medical appliances of today work on pre-programmed instructions. The circuitry and logic in most of the medical equipment is basically a computer.

The functioning of hospital-bed beeping systems, emergency alarm systems, X-ray machines and several such medical appliances is based on computer logic.

New Cloud to Forecast the Agricultural Production

The major drawback in Indian agriculture is that there is no control in demand and supply cycle. So farmers are always confused, which type of crop should we cultivate. There are so many reasons behind this situation, First we will list out it, then will try to suggest IT based solution

1. Heterogeneous Climate

2. Unpredictable monsoon
3. Pollution and
4. Variety of Production (Different crops in different regions)

This leads to unbalance in demand and supply cycle. This is most flexible. We can suggest Cloud for forecasting the need and probable productions in coming near future. This cloud can be updated regularly by responsible agricultural officers at village level, so that cumulative data can be available for forecasting the future plan for agricultural production.

Weather Forecasting and Planning

It is already available on <http://www.indiaweather.gov.in/> and <http://www.imd.gov.in/> but it should reach to rural area through mobile or television, and rural beneficiaries should be able to take the advantage for his future. Only temperature and humidity is not sufficient for his future.

Local Language (Voice) interface, Speech Recognition, TTS, Speech Synthesis

As information needed for rural development is present in various regional languages and scripts, so it is required to be available in his language on internet. The best solution is Unicode. Many publishers, web sites, universities and government have been handling information in various languages and when the information is to be digitized, Unicode becomes essential and handy.

Not it becomes mandatory that the operating systems, DBMS systems and web hosting software must have Unicode support, for better searching and editing. India is a one of the big countries in the world in which various types of languages are used; all these language contains rich literature of agriculture, rural and scientific information. For digitization the communication should be in mother tongue.

Conclusion

(recent-trends-no-touch-interfaces.html , 2013) Again peoples are thinking about more natural user interface in ICT. Scientists and researchers are taking more efforts to create better and natural user interface with computers. The Touchless screens can be used effectively in computers, cell phones, webcams and laptops. Research is going on to replace keyboards, mouse with human body parts. Our body parts can be used as input devices for computers. There might be interaction between Human brain and microprocessor directly. Computer can sense the emotions of human being.

In short input of computers begins from punched card. It improved to magnetic disk and tapes, then keyboard and so on up to touch screen. Now the time is come for touch to touch less input. i.e. Special and various forms of computers will found in different automations

across the world. These can be used in Cars, Agriculture, Medical, Education, Science and Engineering, Military and Government which could be fully automated which will not require any input from keyboard. There are five senses for human being, Hearing, sight, touch, Taste and smell. Out of that we are using only one touch sense for communication with PCs. This No-touch interface is nothing but to develop new media of communication excluding touch. That means hearing, sight, Taste and smell. Out of these 4 first two (hearing and sight) are in progress. Hearing can be done with speech recognition and sight can be implemented with high resolution cameras and image processing. Rest of the two (Taste and smell) are the opportunities for upcoming developers.

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