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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

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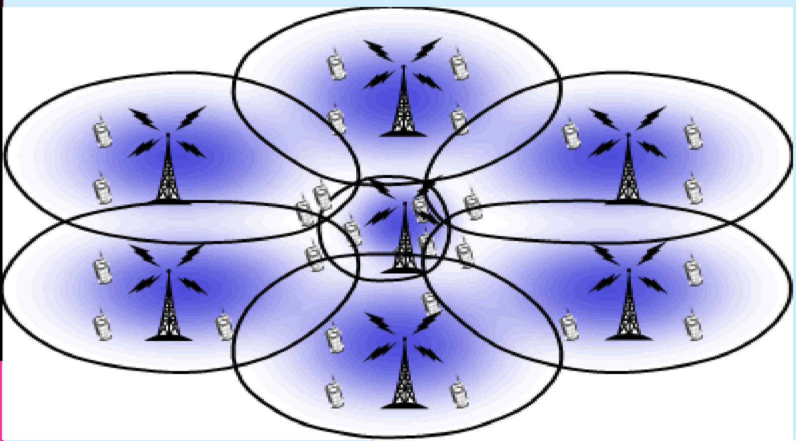
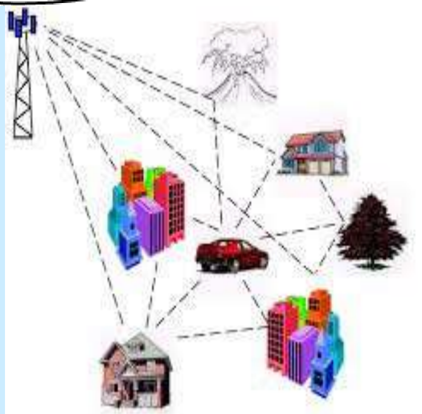
Smart Antennas for Mobile Communication

Smart antennas in mobile communications that enhances the capabilities of the mobile and cellular system such as Faster bit rate, Multi use interference, Space division multiplexing (SDMA), Adaptive SDMA, Increase in range, Multipath mitigation, Decreased inter symbol interference, Best suitability of multi-carrier modulations such as OFDMA and Decreased co-channel interference adjacent channel.



A smart antenna system combines an antenna array with a digital signal processing capability to transmit and receive in an adaptive, spatially sensitive manner. Such a configuration dramatically enhances the capacity of a wireless link through a combination of diversity gain, array gain and interference suppression. The following are distinctions between the two major categories of smart antennas regarding the choices in transmit strategy. They are Switched Beam - A finite number of fixed, predefined patterns or combining strategies (sectors) and Adaptive Array - An infinite number of patterns (scenario-based) that are adjusted in real time.

Switched beam antenna systems form multiple fixed beams with heightened sensitivity in particular directions. These antenna systems detect signal strength, choose from one of several predetermined, fixed beams. Switch from one beam to another as the mobile moves throughout the sector. Switched beam systems combine the outputs of multiple antennas in such a way as to form finely sector zed (directional) beams with more spatial selectivity. The adaptive system takes advantage of its ability to effectively locate and track various types of signals to dynamically minimize interference and maximize intended signal reception. Adaptive system provides optimal gain while simultaneously identifying, tracking, and minimizing interfering signals. A representative depiction of a main lobe extending toward a user with a null directed toward a co-channel interferer as shown.



What makes smart antenna smarts reside in their digital signal processing facilities. Digital format for manipulating the RF data offers numerous advantages in terms of accuracy and flexibility of operation. They capture, convert, and modulate analog signals for transmission as digital signals and reconvert them to analog information on the other end. The dual purpose of a smart antenna system is to augment the signal quality of the radio-based system through more focused transmission of radio signals while enhancing capacity through increased frequency reuse, Signal Gain, Interference Rejection, Spatial Diversity, SDMA and Power Efficiency.

Each approach forms a main lobe toward individual users. It attempts to reject interference or noise from outside of the main lobe. Switched beam is an extension of the current micro cellular or cellular sectorization method of splitting a typical cell. It further subdivides macro-sectors into several micro sectors as a means of improving range and capacity. Each micro sector contains a predetermined fixed beam pattern. Adaptive antenna technology can dynamically alter the signal patterns to near infinity to optimize the performance of the wireless system. Adaptive arrays utilize sophisticated signal processing algorithms.

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TELEMEDICINE SYSTEM

This system is used in hospitals, because the patients in the ICU need a constant monitoring of their body, Respiratory Temp, Saline Status and ECG. Our project is a working model that incorporates sensors to measure all these parameters and transfer it to the computer, so that the patient condition can be analyzed to by doctors in any part of the hospital wherever they are. thus it reduces doctor's work load and also gives more accurate results, wherever there is an abnormality fell by the patient, we have also incorporated saline monitoring system which gives an alarm when the saline bottle about to empty.

Objectives

TELEMEDICINE

refers to the utilization of telecommunication technology for medical diagnosis, treatment and patient care. It can be divided into two modes of operation. Real patient data are available at the remote terminal immediately after acquisition and time mode which is the store-and-forward mode which involves accessing the data at a later time. Recent technological advances have enabled the introduction of broad range of telemedicine application such as Tele-radiology, Tele-consultation, and Tele-surgery, Remote patient monitoring and health care records management that are supported by computer network and wireless communication.

The mobile phone has been recognized as a possible tool for telemedicine since it became commercially available. The aim of this project is to utilize computer systems as access terminals for general enquiry and patient monitoring services. We also utilize mobile phones for sending short messages to doctor, if patient is in distress. With this system, authorized users, who can be doctor or patient's relatives, can view the patient's monitored physiological parameters on access terminals. The current and foreseen ageing of the world population has made patient-monitoring an attractive application because such services would enable early detection and diagnosis of pathological symptoms in elderly patients, who generally suffer from chronic diseases.

System specification

This system is a working model, which is used in IC unit to monitor the patient's body status. The various inputs taken from a patient and measured the body temperature, respiratory temperature, heartbeat and ECG. And also checked that if any abnormality in-patient it alerts doctor by gives beep sound and also send SMS to the doctor's mobile. By using the display we can check online parameters including body temperature, respiratory temperature, heart beat ad ECG.

The main features of this project are:

8 independent analog channels available

•Annunciation 's systems are included for all this analog inputs

•Saline status is displayed in the monitor

•On-line graphics for selectable parameters

•On-line recording of all process parameters in the interval selectable by the user, which is most useful for future analysis and failure detection.

TYPES

Store and forward

Store-and-forward telemedicine involves acquiring medical data (like medical images, bio signals etc.) and then transmitting this data to a doctor or medical specialist at a convenient time for assessment offline. It does not require the presence of both parties at the same time. Dermatology (cf: teledermatology), radiology, and pathology are common specialties that are conducive to asynchronous telemedicine. A properly structured medical record preferably in electronic form should be a component of this transfer. A key difference between traditional in-person patient meetings and telemedicine encounters is the omission of an actual physical examination and history. The 'store-and-forward' process requires the clinician to rely on a history report and audio/video information in lieu of a physical examination.

Remote monitoring

Electronic consultations are possible through interactive telemedicine services which provide real-time interactions between patient and provider. Many activities such as history review, physical examination, psychiatric evaluations and ophthalmology assessments can be conducted comparably to those done in traditional face-to-face visits. In addition, "clinician-interactive" telemedicine services may be less costly than in-person clinical visit

Emergency telemedicine

Common daily emergency telemedicine is performed by SAMU Regulator Physicians in France, Spain, Chile and Brazil. Aircraft and maritime emergencies are also handled by SAMU centers in Paris, Lisbon and Toulouse.

A recent study identified three major barriers to adoption of telemedicine in emergency and critical care units. They include:

•regulatory challenges related to the difficulty and cost of obtaining licensure across multiple states, malpractice protection and privileges at multiple facilities

•Lack of acceptance and reimbursement by government payers and some commercial insurance carriers creating a major financial barrier, which places the investment burden squarely upon the hospital or healthcare system.

•Cultural barriers occurring from the lack of desire, or unwillingness, of some physicians to adapt clinical paradigms for telemedicine applications.

Telenursing

Telenursing refers to the use of telecommunications and information technology in order to provide nursing services in health care whenever a large physical distance exists between patient and nurse, or between any number of nurses. As a field it is part of telehealth, and has many points of contacts with other medical and non-medical applications, such astelediagnosis, teleconsultation, telemonitoring, etc.

Telenursing is achieving significant growth rates in many countries due to several factors: the preoccupation in reducing the costs of health care, an increase in the number of aging and chronically ill population, and the increase in coverage of health care to distant, rural, small or sparsely populated regions. Among its benefits, telenursing may help solve increasing shortages of nurses; to reduce distances and save travel time, and to keep patients out of hospital. A greater degree of job satisfaction has been registered among telenurses.

In Australia, during January 2014, Melbourne tech startup Small World Social collaborated with the Australian Breastfeeding Association to create the first hands-free breastfeeding Google Glass application for new mothers. The application, named Google Glass Breastfeeding app trial, allows mothers to nurse their baby while viewing instructions about common breastfeeding issues (latching on, posture etc.)

Teletrauma care

Telemedicine can be utilized to improve the efficiency and effectiveness of the delivery of care in a trauma environment. Examples include:

Telemedicine for trauma triage: using telemedicine, trauma specialists can interact with personnel on the scene of a mass casualty or disaster situation, via the internet using mobile devices, to determine the severity of injuries. They can provide clinical assessments and determine whether those injured must be evacuated for necessary care. Remote trauma specialists can provide the same quality of clinical assessment and plan of care as a trauma specialist located physically with the patient.

Telemedicine for intensive care unit (ICU) rounds: Telemedicine is also being used in some trauma ICUs to reduce the spread of infections. Rounds are usually conducted at hospitals across the country by a team of approximately ten or more people to include attending physicians, fellows, residents and other clinicians. This group usually moves from bed to bed in a unit discussing each patient. This aids in the transition of care for patients from the night shift to the morning shift, but also serves as an educational experience for new residents to the team. A new approach features the team conducting rounds from a conference room using a video-conferencing system. The trauma attending, residents, fellows, nurses, nurse practitioners, and pharmacists are able to watch a live video stream from the patient's bedside. They can see the vital signs on the monitor, view the settings on the respiratory ventilator, and/or view the patient's wounds. Video-conferencing allows the remote viewers two-way communication with clinicians at the bedside.

Specialist care delivery

Telemedicine can facilitate specialty care delivered by primary care physicians according to a controlled study of the treatment of hepatitis C. Various specialties are contributing to telemedicine, in varying degrees.

Teleophthalmology is a branch of telemedicine that delivers eye care through digital medical equipment and telecommunications technology.

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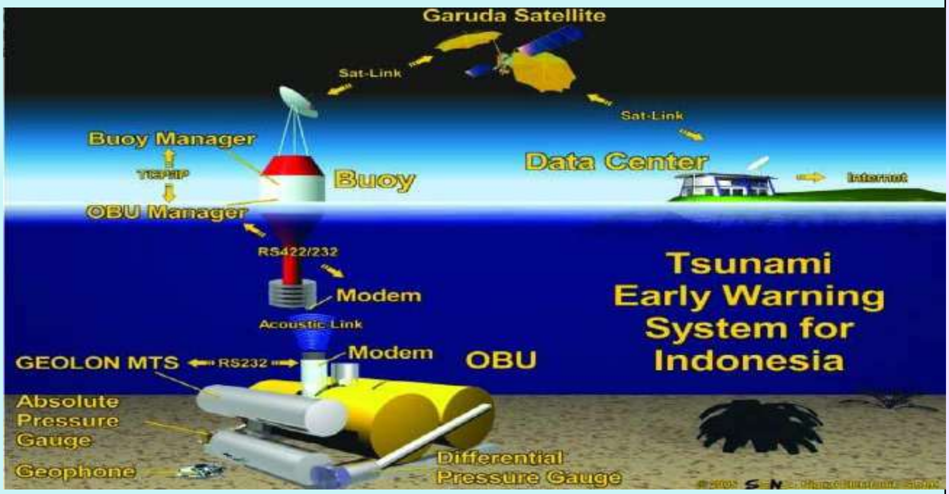
Tsunami Warning System

In the early hours of 26'Th December 2004 the world witnessed one of the most devastating natural disasters in the recent times causing the death of nearly 80,000 people. Tsunami a powerful fast moving wave by an under sea disturbance. If we had sufficient warning system to give indications ,then we certainly could avoid this much of destruction. With the present technology, even a slight under-sea disturbance can be detected by special detectors placed on the sea floor. These signals are picked by the surface buoy, which sends data to satellite for further distribution to ground stations.

Tsunami is a Japanese word represented by two words, Tsu-harbor, Nami-wave means a destructive, Ocean riding, gigantic wave created by an under sea disturbance.

More than a quarter of all reliably reported Pacific tsunamis since 1895 originated near Japan. This is not surprising, because Japan is precariously situated near the colliding margins of four tectonic plates. Recognizing the recurring threat, the Japanese have invested heavily over the years in tsunami hazard mitigation, including comprehensive educational and public outreach programs, an effective warning system, shoreline barrier forests, seawalls and other coastal fortifications.

Propagation of the tsunami transports seismic energy away from the earthquake site through undulations of the water, just as shaking moves the energy through the earth. At this point, the wave height is so small compared with both the wavelength and the water depth that researchers apply linear wave theory, which assumes that the height itself does not affect the wave's behavior. The theory predicts that the deeper the water and the longer the wave, the faster the tsunami. This dependence of wave speed on water depth means that refraction by bumps and grooves on the seafloor can shift the wave's direction, especially as it travels into shallow water. In particular, wave fronts tend to align parallel to the shoreline so that they wrap around a protruding headland before smashing into it with greatly focused incident energy. At the same time, each individual wave must also slow down because of the decreasing water depth, so they begin to overtake one another, decreasing the distance between them in a process called shoaling.



Refraction and shoaling squeeze the same amount of energy into a smaller volume of water, creating higher waves and faster currents.

Regional warning systems

Regional (or local) warning system centers use seismic data about nearby recent earthquakes to determine if there is a possible local threat of a tsunami. Such systems are capable of issuing warnings to the general public (via public address systems and sirens) in less than 15 minutes. Although the epicenter and moment magnitude of an underwater quake and the probable tsunami arrival times can be quickly calculated, it is almost always impossible to know whether underwater ground shifts have occurred which will result in tsunami waves. As a result, false alarms can occur with these systems, but the disruption is small, which makes sense due to the highly localized nature of these extremely quick warnings, in combination with how difficult it would be for a false alarm to affect more than a small area of the system. Real tsunamis would affect more than just a small portion**.**

Conveying the warning

Detection and prediction of tsunamis is only half the work of the system. Of equal importance is the ability to warn the populations of the areas that will be affected. All tsunami warning systems feature multiple lines of communications (such as SMS, e-mail, fax, radio, texting and telex, often using hardened dedicated systems) enabling emergency messages to be sent to the emergency services and armed forces, as well to population-alerting systems (e.g. sirens) and the Emergency Alert System .

A tsunami warning system (TWS) is used to detect tsunamis in advance and issue warnings to prevent loss of life and damage. It is made up of two equally important components: a network of sensors to detect tsunamis and a communications infrastructure to issue timely alarms to permit evacuation of the coastal areas.

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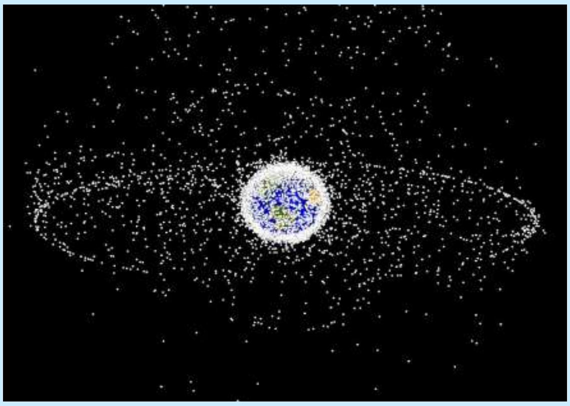
A GPS based debris removal system

The wireless communication and networking on a large scale is carried out through satellites. Inter planetary communication is also made possible due to satellite technology. The various kinds of space debris or space junk that are revolving around our earth in an orbit possess a threat to the satellite communications. Infact, these particles whether tiny or big are on their way to destroy the whole system of satellites and space stations orbiting around our globe in the near future. This deadly debris must be eliminated in order to have a complete access to our earth orbiting satellites. The concept of light pressure exerted by laser beams provides a valuable tool to eliminate these particles. The following section gives an idea of reducing the space debris and also eliminating them.

In the modern era, communication plays a significant role in human life, a country's economy and further development in science and technology.

The communication system has developed to an extent that information exchange across any part of the blue planet is very easy. This is possible due to the satellites revolving around us. Every nook and corner of the earth can be accessed via satellites.

As Newton said, "For every action there is an equal and opposite reaction", the development in the satellite technology heads in one direction launching many satellites and the debris created due to these satellites possess a threat of destroying the satellites and heads in the opposite direction. In the next 100 years, man's thirst for wider and better universal communication will lead in launching of many satellites which in turn produces huge amount of debris. The



space around the earth would get so congested that it needs to be cleaned. We have discussed about the various proposals that are made to clean the space junk. We have also suggested methods, which use the radiation pressure exerted by high intensity lasers and sunlight in removing space debris.

SPACE JUNK

The unwanted materials that are revolving around the earth in different orbits are called space junk. It can be classified into:

Natural junk- like meteorites, asteroids, comet tail etc. Man made junk-effluents from space missions, dead satellites, debris due to collision, spent rocket stages, discarded equipment, and fragments from satellite breakups etc.

Space junk can be created in several ways: When satellites separate from their boosters, they shed shrouds and other bits and pieces. They can collide. Boosters can malfunction and explode. Or spent booster segments with still-pressurized fuel tanks can explode when hit by debris or after joints weaken from the constant freezing and thawing. Solid-fuel motors can give off "slag" as part of their exhaust plumes. A view of the space junk around earth

NASA estimates there are 4 million pounds of junk orbiting Earth. More than half the impacting debris is manmade. It travels at about 10 kilometers per second (22,370 mph). Small asteroids and meteoroids, which is the natural debris typically, move at twice that speed. More than 200 objects, most of them rubbish bags, were released by the Mir space station during its first 10 years of operation.

The space debris problem emerged in the second half of the 20th century with the launch of first artificial Earth satellites. Left at earth orbits, space objects began to pose a threat to functioning spacecraft and, in particular, to stations with crews on board.

With the expansion of space exploration the population of space debris began to grow rapidly. It required appropriate measures to be taken. In 1993, a number of space agencies created the Inter-Agency Space Debris Coordination Committee (IADC). The primary purposes of this organization are to exchange information between committee members, to facilitate opportunities for cooperation, and to identify debris mitigation options. This committee has developed the "IADC Space Debris Mitigation Guidelines".

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Mobile Virtual Reality Service

A mobile virtual reality service (VRS) will make the presence and presentation of the sounds and sights of an actual physical environment virtually available everywhere in real time through the use of mobile telecommunication devices and networks.

Furthermore, the VRS is the conversion of a physical system into its digital representation in a three-dimension (3D) multimedia format. This paper addresses one aspect of the notion of bringing an actual multimedia environment to its virtual presence everywhere in real time .

An international telecommunication union (ITC) recommendation document, containing ITU's visions on mostly forward-looking and innovative services and network capabilities, addresses the capability needed in a telecommunication system to allow mobile access to real-time sights and sounds of an actual physical environment in the contest and forms of a VRS episode .

Presently, the availability of a VRS is limited to fixed-access phenomena in non -real time , for example , entertainment machines and various simulations equipment. There are also some limited fixed-access and real-time services that require low data transmission rates, such as net meetings. In the latter case, a user can experience a limited real-life environment as opposed to the former case of a non-real-life computer-generated environment. These existing virtual reality services do not allow user control in viewing 3D environments, and they are generally limited to viewing images on a monitor in two dimensions.

The VRS-capable systems, however, will allow rather 3D representations of remote real-life environments. For instance, a passenger in a train or in a car could become a participant in a conference call in a 3D environment or become virtually present among the audience in a concert hall or sports stadium viewing a live concert or event.

PROBLEM STATEMENT

From a users perspective, the VRS is defined as the experience of viewing an object in its 3D environment and sensing its sound with its natural and real-world quality. By limiting the VRS to sight and sound, it is meant to disclaim creation of any other aspects of an actual physical environment, for example, smell of a flower or taste of a food. A few examples of the VRS is listed below:

A virtual conference session depicting to every participant the presences of others in a virtual conference room with projector screen, drawing board, and so on.

• A virtual movie theaters where a user can view movies with the same feel as being in a movie theater.

• A virtual hospital operation room (OR) where a surgeon can remotely perform an actual operation and/or provide training to assistant surgeons and interns by showing and/or performing actual procedures.

• A virtual concert hall where a conductor can have the virtual presence of all, or a selective number of instruments players participating from all over the world for a rehearsal or actual performance.

• A virtual house, shop, or storage facility where a user can do a security check, identify product availability, or determine inventory levels of various items, respectively.

• A virtual command center for navigating an aircraft, driving a train, or operating a motor vehicle where the virtual environment is created for the cockpit, the locomotive, or the driver's seat respectively.

• From a network operator's perspective, the provision of the VRS is the conversion of the sights and sound of an actual physical system into their virtual representation. For each required case and application, the development of the software platforms for the control and the management of the VRS and in terms of its control logic and application-programming interface is a major challenge.

The VRS will include both terminal and personal mobility. It could be a set up in a limousine, hotel, airport, home or office. Depending on the type and complexity of the actual system, the estimate for required data transmission

rates varies from a minimum of tens of Megabits to a few Gigabits per user or user equipment.

Currently, the availability of the VRS is limited to fixed application s in noon-real time, for example, entertainment machines and flight simulators. Some limited feature- fixed real-time services such as video-conferencing and net meetings, which require low data transmission rates, are also offered. However, the mobile, wireless, and real-time accessed sights and their virtual reality presence are still dreams.

•Major obstacles and bottlenecks to the achievement of such an ambitious goal include:

•Lack of VRS-capable user terminal equipment.

• Inadequate data transmission rates over the air, and

• Absence of efficient and suitable signaling and controlling network elements for initialing, establishing, maintaining and terminating mobile VRS episode.

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Smart Cameras in Embedded Systems

A smart camera performs real-time analysis to recognize scenic elements. Smart cameras are useful in a variety of scenarios: surveillance, medicine, etc. We have built a real-time system for recognizing gestures. Our smart camera uses novel algorithms to recognize gestures based on low-level analysis of body parts as well as hidden Markov models for the moves that comprise the gestures.

These algorithms run on a Trimedia processor. Our system can recognize gestures at the rate of 20 frames/second. The camera can also fuse the results of multiple camerasRecent technological advances are enabling a new generation of smart cameras that represent a quantum leap in sophistication. While today's digital cameras capture images, smart cameras capture high-level descriptions of the scene

and analyze what they see. These devices could support a wide variety of applications including human and animal detection, surveillance, motion analysis, and facial identification.

Video processing has an insatiable demand for real-time performance. Fortunately, Moore's law provides an increasing pool of available computing power to apply to real-time analysis. Smart cameras leverage very large-scale integration (VLSI) to provide such analysis in a low-cost, low-power system with substantial memory. Moving well beyond pixel processing and compression, these systems run a wide range of algorithms to extract meaning from streaming video.

Because they push the design space in so many dimensions, smart cameras are a leading-edge application for embedded system research.

Detection and Recognition Algorithms

Although there are many approaches to real-time video analysis, we chose to focus initially on human gesture recognition-identifying whether a subject is walking, standing, waving his arms, and so on. Because much work remains to be done on this problem, we sought to design an embedded system that can incorporate future algorithms as well as use those we created exclusively for this application.

Our algorithms use both low-level and high-level processing. The low-level component identifies different body parts and categorizes their movement in simple terms. The high-level component, which is application-dependent, uses this information to recognize each body part's action and the person's overall activity based on scenario parameters.

Low-level processing

The system captures images from the video input, which can be either uncompressed or compressed (MPEG and motion JPEG), and applies four different algorithms to detect and identify human body parts.

Region extraction: The first algorithm transforms the pixels of an image into an M ¥ N bitmap and eliminates the background. It then detects the body part's skin area using a YUV color model with chrominance values down sampled Next the algorithm hierarchically segments the frame into skin-tone and non-skin-tone regions by extracting foreground regions adjacent to detected skin areas and combining these segments in a meaningful way.

Contour following: The next step in the process involves linking the separate groups of pixels into contours that geometrically define the regions. This algorithm uses a 3 ¥ 3 filter to follow the edge of the component in any of eight different directions.

Ellipse fitting: To correct for deformations in image processing caused by clothing, objects in the frame, or some body parts blocking others, an algorithm fits ellipses to the pixel regions to provide simplified part attributes.

SOLUTIONS

The VRS realization scheme is built upon the development and availability of the following entities:

- Actual physical environment (APE)
- VRS user equipment (VUE)
- VRS access system (VAS) and
- VRS core system (VCS).

The figure presents a schematic view of these entities in a high-level illustration of the VRS functional architecture.

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