# CHapter 2 Rough

## Vision Based Gesture Analysis

#### **Vision Based hand Gesture Recognition for Human-Computer Interaction: A Survey**

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Better Idea for project – a document scanner that will only pick out highlighted words.

**INTRO**

* Technology has become so embedded in our daily lives that we use it to work, shop, communicate and ... entertain ourselves. (Rautaray & Agrawal, 2015)
* Firstly based in the past on punched cards, reserved to experts, the interaction has evolved to the graphical interface paradigm
* Even if the invention of keyboard and mouse is a great progress, there are still situations in which these devices are incompatible for HCI.
* Hand movements are thus a mean of non-verbal communication
* A gesture can be defined as a physical movement of the hands, arms, face and body with the intent to convey information or meaning (Mitra and Acharya 2007) g hand gestures for interaction can help in achieving the ease and naturalness desired for human computer interaction
* The following comprehensive analysis of the surveys and articles published earlier related to hand gesture recognition could be used for the design, development and implementation of evolved, robust efficient and accurate hand gesture recognition systems for human computer interaction
* Gesture recognition, semantically meaningful commands, design and development of such systems than can identify explicit human gestures as input and process these gesture representations for device control through mapping of commands as output
* Hands involved in 62% of body parts/objects used for gesturing(Fig.1).

**All above = Rautaray**

* Table 1 analyses other studies and presents key findings, needs to be incorporated here
* Ultra-sonic based motion trackers are composed sonic emitters that emit ultrasound, sonic discs that reflect ultrasound and multiple sensors that time the return pulse. The position and orientation of gestures are computed based on propagation, reflection, speed of time 123 S. S. Rautaray, A. Agrawal and triangulation, respectively (Kanniche 2009). Low resolution and lack of precision are pertained to this set of devices but their applicability to environments having lack of illumination and presence of magnetic obstacles or noise make them usually favored. Inertial primed devices work on the basis of variations of earth’s magnetic field for detecting motion. Schlomer et al. (2008) proposed gesture recognition using Wii-controller employing HMM independent of the target system. Bourke et al. (2007) proposed recognition systems to detect the normal gestures which are used in our daily activities using accelerometer. Noury et al. (2003) proposed system for multimodal intuitive media browsing in which the user can learn personalized gestures. Variations of artificial magnetic field for motion detection are measured using magnetic primed devices.
* The main challenge of vision-based hand gesture recognition is to cope with the large variety of gestures. Recognizing gestures involve handling a considerable number of degrees of freedom (DoF), huge variability of the 2D appearance depending on the camera view point (even for the same gesture), different silhouette scales (i.e. spatial resolution) and many resolutions for the temporal dimension (i.e. variability of the gesture speed). Moreover, it need also to balance the accuracy-performance-usefulness trade-off according to the type of application, the cost of the solution and several criteria’s such as real-time performance, robustness, scalability and user-independence.
* Vision based devices though is user friendly but suffer from configuration complexity and occlusion problems. allergy, magnetic devices which raises risk of cancer etc (Nishikawa et al. 2003). Whereas vision based devices have initial challenge of complex configuration and implementations but are more user friendly and hence more privileged for usage in long run

**3 – Vision based hand gesture taxonomies and representation**

* Gestures may be articulated with any of the body parts or with combination of one or many of them. Gestures being major constituent of human communication may serve as an important means for human computer interaction too. Though the significance and meaning associated with different gestures differ very much with cultures having less or invariable or universal meaning for single gesture… For example pointing an extended finger is a common gesture in USA & Europe but it is taken to be as a rude and offensive gesture in Asia.
* Theoretically the literature classifies hand gestures into two type’s static and dynamic gestures. Static hand gestures are defined as orientation and position of hand in the space during an amount of time without any movement and if a movement is there in the aforementioned time duration it is called dynamic gesture.
* According to research (Hall 1973) 35 % of human communication consists of verbal communication and 65 % is non-verbal gesture based communication.
* **Fig.3 is a tree of gestures, use it.**
* Illustrator gestures emphasize the key point in speech to depict the communications pronouncing statements… dependent on communicators thought process and speech.
* **Metaphoric & Iconic Gestures are relevant.**
* The 3D model based hand gesture recognition has different techniques for gesture representation namely 3D textured volumetric, 3D geometric model and 3D skeleton model
* The 3D model based hand gesture representation defines 3D spatial description of human hand for representation with temporal aspect being handled by automation. This automation divides the temporal characteristics of hand gesture into three phases (McNeill 1992) i.e. the preparation or prestroke phase, the nucleus or stroke phase and the retraction or poststroke phase in which every phase corresponds to one or many transitions of spatial states of the 3D human model
* **Fig.4 is a tree diagram of different approaches to computer gesture representation.**

**All above = Chakraborty**