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IMPROVEMENT AND AESTHETIC ENGAGEMENT FOR HUMAN-COMPUTER INTERACTION RESEARCH

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ABSTRACT

Human-computer interaction (HCI) is a cutting-edge technology that enables ubiquitous and self-sufficient service broadcasting in interpersonal interactions. Person-computer interaction (HCI) merges with computer vision methods for human recognition and object categorization in autonomous communication settings. Human-computer interaction (HCI) designers are tasked with creating systems that reduce the gap between the human user's mental picture of what they want to achieve and the computer's ability to do those tasks. As the number of people who regularly use computers grows, so does the importance of the role computers and information technologies play in a broad range of companies, leading to a greater reliance on various computer-based information systems.

The new generations of computer interfaces will have to overcome the same fundamental organizational, societal, and technological issues and challenges that will impact the effective use and efficient design of human-computer interactions that will be presented to us by the technologies of the twenty-first century.

Keywords: Computer vision; Deep belief networks; Human-computer interaction; Interaction behavior; Multimodal processing

INTRODUCTION

Human-computer interaction (HCI) refers to a set of technologies that enable two-way communication and the exchange of information between mobile people and distant computers. Human-computer interaction (HCI) is used to facilitate communication between people and the exchange of data [1]. The prediction technique helps analyze the data system process, producing a decision-making system at a faraway place. One or more network operators establish a uniform, well-defined internet policy known as an autonomous system (AS) [2], a collection of IPv4 and IPv6 prefixes under the control of a single administrative authority or domain. In the past, it was thought that a single entity, often an ISP or a large, independently formed company with multi-network connections that conform to a specified routing policy, was all that was required to ensure proper operation. Many cases may be hosted by an ISP, but only one will be visible to the Internet due to the ISP's routing policy.

The desired user's productivity and communication efficacy may be improved by using the prediction approach by matching data from before and after [3]. A decision is made at a particular moment to determine whether or not specific information is reliable. The HCI and user interaction are computed using various methods, reducing the number of mistakes made [4]. In most cases, the HCI is used to connect users and exchange data about their security.

Engineering, cognitive science, and computer science [5, 6] are only a few of the areas that contribute to HCI's development.

AI technology, known as computer vision (CV), uses computers to interpret and respond to images. CV's purpose is object recognition based on obtained input and output to the user [7]. This detection is carried out using previously established information, and the processing is carried out in response to a user query to identify the item or picture. It is measured against a sample of data used for instruction. The user creates the analysis and results. As a result, HCI takes advantage of CV, where the detection processing is optimized. When detection is requested, the CV analyzes the data by categorizing the item and considering the HCI's input. When a user requests, three distinct sorts of processing are triggered. The interaction is supplied through HCI, communication is formed between the sender and receiver, and then the integration of requests and replies is generated. CV identifies the user so that the computer and user may effectively communicate from afar [8].

Human-computer interaction (HCI) optimization is used to facilitate productive and trustworthy data collection from users by facilitating effective communication between users and systems. To get the best results in object detection and interaction, CV-based HCI (CV-HCI) uses optimization. As a result, the assessment is conducted in a specified time frame, and the HCI quality is improved using different methodologies. Therefore, CV offers object identification from that HCI to provide information to the enquiring user. Processing is improved in this way. In order to deliver the best data for processing in HCI, it is essential to do periodic monitoring of the collected data. Optimization is carried through using many methods of efficient computing.

A. The need for HCI

Dix et al. [9] argue that while creating computers and other similar devices, designers must remember that users have specific goals and wish to integrate them into their workflow as naturally as possible. The designers of these technologies must be able to put themselves in the shoes of their end users and understand the problems they will face before they can create a workable solution. Creating an executable system is crucial, but making the computer interface intuitive, simple, and time-saving is even more critical. Even if it is safe to assume that all designers are also users, it is unclear why anybody would bother teaching them how to design since they already have a decent sense of what a user-friendly interface should look like. Since the user interface is such a critical component that determines the efficacy and quality of usage and communication between the user and the virtual environment [10], Dix et al. [9] state that building a consistent and robust user interface is not a simple effort and takes substantial expertise.

Further, the user interface is not an afterthought and must be planned and developed along with the rest of the system. In other words, it should facilitate the activities people genuinely desire to engage in. Peak [11], Greenberg [12], and other researchers [13] all acknowledged the relevance of HCI in their respective studies. It recommended that it be taught to provide professionals in the field with the skills they need to do their jobs.

Several academics, including Fetaji et al. [14], Tufte [15], Corso [16], Preece [17], and Faconti [18], identified this as a means of interaction between humans and machines in a study by Fetaji

et al. [14]. Human-computer interaction, in Tufte's opinion (p. 19), is the result of two competent information processors (human and machine) trying to exchange data over a limited and cumbersome channel. However, Corso [16] defines HCI as two-way communication between humans and machines, noting that today's interfaces are equipped with computer vision, voice and audio processing, and sensors that hold great potential for facilitating more human-like interactions between humans and machines. In contrast, Preece [17] agrees with Corso[16] that virtual worlds and virtual realities generally provide a sensation of direct physical presence, sensory clues in three dimensions, and a natural form of interaction. HCI, as suggested by Faconti [18], suggests that the new interfaces of many application systems that began to integrate numerous devices used together began to enhance communication.

In contrast, HCI is defined as a branch of science, design science, and engineering by researchers like Newell and Card [19], Carroll and Campbell [20], and Long and Dowell [21] in a study by Fetaji et al. [14]. According to Newell and Card [19], HCI is a "science as tempered by approximation" that equips designers with engineering-style ideas and techniques. However, Carroll and Campbell (32) describe HCI as a field of design science that uses a craft-based approach and novel research technique to assess systems in their intended and tasks environment, with the findings informing designers of subsequent generations of systems. Human-Computer Interaction (HCI) is a subfield of engineering described by Long and Dowell [21] as the study of how people and machines work together to get things done, with further analysis breaking down HCI into two subfields: HCI for people and HCI for machines. All three definitions come from the same study by Fetaji et al. 3, which examines how people engage with computer technology and how these technologies might be made more user-friendly, practical, and intuitive.

RELATED WORKS

Several research projects by various authors are discussed here. As a means of deploying two forms of joint attention based on spatial segmentation and temporal localization, Huang et al. [22] created a hierarchical conditional random field. They suggested using an eye-tracking camera to keep tabs on people's collective focus while an iterative optimization process filtered out distracting extraneous information.

Fang et al. [23] combined convolutional neural networks (CNN) with deep convolution networks to recognize human gestures. The data was analyzed using an expression recognition method that derives gesture categorization. The team's main goal was to lessen the amount of ambient noise and light fluctuations.

In their discussion [24], the authors noted that the least-squares method is used in a rotating fashion depending on the response component in inexpensive multivariate curve resolution. Using this information, we can quickly address and optimize the response factor. The CV uses second-order data processing to investigate chemical/external pretreatment in this case.

Based on LSTM, a new method of connectionist temporal classification using bidirectional and convolutional LSTM was created. It demonstrates an improved categorization strategy in terms of accuracy. Extraction and recognition in [25] are based on analyzing handwriting gestures.

To solve this interactive problem, Dometios et al. [26] designed a coordinate change dynamic movement primitive. In this study, we evaluate user-adaptive online robot mobility by

implementing a leader-follower structure with detailed monitoring and provision of all activities.

A median compound local binary pattern (MDCLBP) analysis was done via an oriented gradient histogram to improve system performance. In [27], the texture-based information for analyzing the robot's engagement with the end-user or user-to-user communication is fetched using sign and magnitude.

To improve gesture detection and facial expression identification, [28] proposes a video semantic feature-learning technique. In this work, we develop two methods for analyzing images' features: a distance-weighted approach and a k-nearest-neighbor technique. As a result, the video's picture characteristics are extracted to improve its discriminability.

An interaction model based on multinomial kernel logistic regression with group-of-features relevance is proposed in [29]. In this study, gradient descent was slowed down in areas where it could identify distinct HCI deployment phases. All input weights were used to conduct the analysis, which was then compared to the datasets, and the findings were delivered.

[30] shows a ray-tracing expression detector based on HCI feature point placement. Calculations were made to determine where two eyes met on a person's face. This feature's point extraction was conceived by tracking the eyes' spatial motions.

Using gesture recognition for interaction analysis, Li [31] demonstrated a robot arm powered by a 3D solid-state motor. We employed a work-matching algorithm to locate gestures by comparing them to the target gesture and the motions that came before them. Discrete wavelet transform and HCI based on interaction modes were employed in this calculation to recognize the gestural changes.

Zhou et al. [32] established a muscle computer interface when analyzing hand motions in real-time. Hierarchical k-medoids, a three-tiered structure, combine electromyography signals with depth vision. Accuracy was enhanced as the study established the cluster characteristics.

An efficient HCI has been designed using 2D-CNN, in which the region of interest (ROI) is retrieved to identify the hand area by carrying out two different sorts of predictions. This study uses a cascade classifier to handle the enlarged picture frame for ROI extraction.

Using matching, the authors of [33] employ prediction learning to pinpoint a specific hand area. In [21], the author uses a Support vector machine (SVM) to identify the gesture across a three-dimensional space. In order to infer depth information from the motions, this technique makes use of a multimodal sensor. The SVM uses this wealth of data to identify the gesture in real-time software.

Using support vector machines (SVMs), researchers [34] were able to identify 3D-based human interaction recognition and enhance salient activities. In this case, the kinetic sensor's gesture was extracted using hierarchical spatial-temporal saliency to pick up on the first swayings. The primary goal of this study was to raise the bar for how well it recognizes things.

The most effective therapy for diabetic retinopathy (DR..) is an early diagnosis by regular screening, which is critical for a better prognosis [35]. The ability to automatically scan images will aid physicians in making a speedy and accurate diagnosis. Imaging technology is beneficial for analyzing retinal fundus pictures in this scenario. In this post, we will go through the three key steps necessary to create an automated DR..detection model: (a) picture

preprocessing, (b) blood vessel segmentation, and (c) classification. There are two stages in the preprocessing phase: the RGB to Lab conversion and the enhanced contrast.

In recent years, total hip arthroplasty (THP) [36] has evolved into a very effective pain-relieving and performance-enhancing surgical technique. The primary goal of this work is to design and evaluate a deep learning synergist (SDL) for THP that can analyze and predict many parameters, including length of stay, cost of a stay, and the likelihood of discharge. Even more so, there is uncertainty in making forecasts. The PSP model has been enhanced by the fine-tuning of all patient cohorts. Concerning learning, confidence, acceptability, and validity, the proposed SDL paradigm fared better. The provided methodology may be used to implement PSP for tiered payments [37]; however, this will depend on the specifics of each scenario.

AESTHETICS AND HCI

There is a slew of new conferences and workshops looking at the ramifications of computing's permeation into our daily lives from many angles. Aesthetics, emotion, enjoyment, experience, expressiveness, and similar concepts are becoming more commonplace in HCI discussions. Regarding interactive technology, aesthetics are starting to be seen as a significant concern. Aesthetics is a broad word often employed in conjunction with other concepts. Here we offer the definition and the true meaning of the term. The Oxford English Dictionary defines aesthetics as the science that examines the circumstances of sensual perception" and "ii) the philosophy or theory of taste, or the experience of the beautiful in nature and art" (both at p. 338). "Ask contemporary aestheticians what they do, however, and they are likely to respond that aesthetics is the philosophical analysis of the beliefs, concepts, and theories implicit in the creation, experience, interpretation, or critique of art," KellyKelly states [38], writes in the introduction to Encyclopaedia of Aesthetics, one of the most comprehensive references on the subject [38]. However, it is hard to pin down precisely what it is about. It also notes that contemporary aesthetics' primary goal may be self-definition.

A. Artifact Design

Industrial designers, communication designers, and the newly minted interaction designers have taken on more prominent roles in creating novel artifacts to address a wide range of problems and opportunities since the shift from a narrow focus on work to a broader view of interaction [40]. The aesthetics of future information appliances might be improved by considering user preferences [39]. Combining ideas from work and play is one-way digital technologies may be used in the real world. The fact that these devices can serve as both an emulator and a source of information frequently results in a fresh aesthetic appreciation [40]. Artists often build these gadgets and exhibit them as interactive or digital works of art in museums and galleries.

Evaluation of Artifacts.

The aesthetic value of these many computer devices and artifacts is a problem, not just throughout the design process. "The display should be appealing when positioned in the appropriate location," the authors of [35] write after surveying the heuristic Evaluation match between the design of ambient display and settings.

Ubiquitous Computing.

It is now clear that the personal computer is just one of many potential ways we may design how people interact with computers, thanks to developments in fields like ubiquitous computing, augmented reality, and physical computing. These gadgets, whether housed in private homes, museums, or shown in public spaces, need careful design to ensure they take into account the aesthetic, emotional, and aspirational elements of their surroundings. Ambient displays, for instance, should attract attention due to shifts in the information they offer rather than the way their aesthetic stands out [41].

B. System Design

We refer to developing hardware and software as "system design." The hedonic quality heavily influences users' evaluations of appeal. Thus it is essential to keep it in mind while building software. The authors of [42] gave a novel method for developing 3D sketching tools. Where originality and freshness are valued most, Those in the creative and technological fields work closely together.

C. Attractiveness and Look and Feel of UI

Many publications have discussed the importance of aesthetics regarding the design and presentation of online spaces. As the aesthetics of a user interface become increasingly valued and the appropriate tools become accessible to interface designers, the trend towards more visually pleasant interfaces will continue. While [43] provides a theoretical framework for evaluating a site's aesthetic appeal, [44] recognizes the importance of aesthetics when ranking websites. The importance of aesthetic considerations in a product's or system's success, beyond utility and conventional usability, is becoming more widely acknowledged.

D. Interacting with a System

Rather than being two distinct ideas, aesthetics and interactivity are inextricably bound [26]. In the aesthetics of interaction, the focus switches from controlling the look to controlling the interaction, of which appearance is a component. As the aesthetics of interaction come into play, the emphasis shifts from usability to pleasure.

Mixed Reality and Virtual Reality.

Aesthetics play a significant role in the design of mixed reality or virtual reality devices, which are, in turn, influenced by a wide range of contextual needs. The artistic association of projecting a virtual desert into a curtain of water was considered, and "the curtain rain was chosen for its aesthetic qualities, both in terms of its striking visual image and sound, its asymmetric transparency, and not least, due to the artistic association of virtual reality."

Interactive Art.

"interactive art" refers to a new kind of creative work that relies heavily on technological and user input. Examples of such works are the computational composite [45] and the computational textile kit [46], which include user engagement in novel ways and illustrate multidisciplinary cooperation across research, design, craft, and art. The document's writers propose a methodology created to facilitate the construction of novel interactive technologies.

E. Usability and User Experience

Researchers in human-computer interaction (HCI) do not always welcome aesthetics. According to [47], many experts even see it negatively correlated with usability. The influence of usability vs. aesthetics in HCI has been the subject of ongoing discussion. However, in recent decades, several studies have explored the beneficial effects of beauty. Currently, there is empirical evidence linking the aesthetic quality of a system's user interface to user pleasure [48], which has suggested that aesthetic design may have a more significant impact on user preference than conventional usability [25]. While usability is crucial, an aesthetically pleasing design may sometimes compensate for usability issues. A system's evaluation depends on both its instrumental and non-instrumental aspects, which is why usability and user experience are so closely linked.

F. HCI Research Methods

HCI has developed into a research area focused on designing, developing, and implementing novel information and interaction technology forms. The pragmatic perspective, which considers matters like creativity, craft, and aesthetics, is one of three viewpoints identified about the design theory. The others are the conservative account and the romantic account. Historically, the practices of artists and designers have been heavily influential in the field of human-computer interaction (HCI). As a result, new approaches have emerged in HCI, such as cultural probes, to motivate the development of suitable, enjoyable, and even controversial designs.

THE KEY ISSUES AND CHALLENGES IN HUMAN-COMPUTER INTERACTION

I. Technical Issues

The rapid development of ICT, including mobile technologies, presents additional issues for developing nations. In order to offer customers sophisticated computing services and resources, mobile computing devices like palmtop computers, Personal Digital Assistants (PAD), and mobile devices have difficulty in common with one another: tiny interfaces. Huang [22] argues that the smaller screens of mobile devices make it harder to convey information effectively and guide people to the specific content they seek. Furthermore, power consumption is a primary concern for designers since mobile devices have to function on a limited battery charge. As a result, HCI experts and designers must work hard to create interactive mobile devices that are intuitive, productive, and fun to use. [22].

1. Hardware Challenges

The interface design for mobile devices is more complex. It has more obstacles than regular-sized equipment like desktop phones and printers due to screen size and weight limits for mobility considerations. Among these difficulties are Input constraints, output constraints, and a focus on mobility in design.

- Limited input facilities

Due to the smaller screen size of mobile devices, researchers show that smaller keyboards (an example of an input facility) can be quite tricky and complicated to use compared to the full-blown human-computer interface, especially for users with poor manual dexterity or fat fingers

and those who have difficulty selecting tiny buttons on mobile devices. Huang, however, [22] claims that diverse lines of inquiry into the problem have yielded a wide range of potential responses.

a. Reduce the footprint of a full-sized QWERTY keyboard by four rows using a customized keyboard stick.
b. The novel One-key keyboard considers social acceptability, input, speed, and learnability by lowering the fundamental pitch to overcome this difficulty.
c. Stylus and touch screen interaction.
d. A scroll wheel functions as a push button for performing a particular action and a direction button for navigating the mobile menu, allowing the user to do many actions with a single hand.

- Limited output facilities

Muhanna [49] and Huang's [22] research suggests that developing the screen of mobile devices (the most widely used output facility) for display is the most pressing issue that calls for experimental investigation into the range of possible screen sizes.

- Designing for Mobility

The power management of mobile devices, which not only takes into account energy savings for the processor but also optimizes energy savings for other devices like the display, keyboard, and memory, is an essential factor to consider when designing a mobile device to prove its portability and ease of being held [50]. As a result, it is crucial to provide a power management unit that gathers data in hardware to ensure that the device's performance and portability are not compromised.

2. Software Challenges

Due to their limited display size, mobile devices provide unique difficulties for HCI designers [22]. The researcher Huang [22] enumerated several obstacles, including:

a. If the inputs and outputs of translating a desktop design to a mobile device are not understood, the resulting interaction design may be inefficient. This is where hierarchical menus come in handy; clicking on one item sends the user to a sub-menu, and so on.
b. Because of their tiny screens, mobile devices make it difficult for users to navigate and browse. However, a new interface called roller aims to solve this problem by supplying users with rich contextual information to aid their navigational endeavors.
c. Due to their limited resources and screen size, mobile devices have trouble downscaling huge pictures and icons; as a result, it is recommended to employ vector graphics to enable suitable and resource-saving solutions.

While new technologies are being developed, technical difficulties will arise, and HCI designs, whether for mobile devices or computer-based applications, will get more complex. Therefore, Curran and King [51] argued that in order to build user-friendly HCI systems, HCI designers should interact with consumers frequently.

II. Design and Implementation Issues

Myers [52] argues that a system's or an app's success increasingly depends on how well its user interface functions. Furthermore, he said improper system interface and implementation have been responsible for many calamities. Focusing on HCI challenges and issues in this paper is vital to avoid or minimize the possibility of the same disasters and faults during HCI design and implementation. Myers [52] suggests that the difficulty in designing and implementing human-computer interfaces contributes to the failure of HCI. Thus, he explained why and he explained how to fix the problem.

- ♣ The difficulty in knowing tasks and users

The designers and developers of a system can never know every possible scenario in which it will be used. Additionally, these individuals have difficulty naturally seeing themselves in consumers' shoes. Camerer et al. [53] and Gillan and Breeding [54] in Myers's [52] study show that individuals have trouble recalling their ignorance from the past; specifically, they cannot recall a time when they were complete beginners.

- ♣ The inherent complexity of tasks and applications

However, the new inventions and continual expansion of these technologies have resulted in a rise in the complexity of the tasks and applications, making those with fewer features more difficult to use and understand. Something like how an old-fashioned phone differs from a brand-new mobile device, for instance. Because it is impossible for technology with so many capabilities to have an interface as simple to learn and use as one with just a few functions, the difficulties in HCI design for fashionable mobile devices are relatively considerable compared to a conventional phone. In order to get around this problem, Myers [52] recommended employing metaphors to make interface items appear like something the user is already acquainted with. However, as Carroll [54] points out, this strategy makes things more complicated for users since it emphasizes familiarity with ideas rather than simplifying the interface itself.

- ♣ The variety of different aspects and requirements

Standards, visual design, technical writing, internationalization and performance, numerous levels of details, social considerations, legal difficulties, and implementation time are only some of the many facets of the human-computer interface that need to be balanced. In this article, we will take a high-level look at several research pertinent to the many factors that should be considered during HCI design. Bevan's [55] research on HCI standards will be beneficial since he discusses the various approaches for HCI and provides extensive definitions of each standard, making it easier to understand and implement the standards while designing an interface.

In contrast, Fetaji et al[14] . The study delves into the meat and potatoes of the human-computer interface graphic design, exploring such standard interaction modes as command-line languages, menus, direct manipulation, forms, query dialogue, windows, icons and pointers interface, and virtual reality. The research provided suggestions for fixing the problems with HCI visual design.

- Design is a creative process.

Due to a lack of theory and technique, developing a human-computer interface is still more of an artistic endeavor than a mechanical one to which rules strictly adhere. What T. calls "the creative design process." According to J. Howard et al., [56], the innovative process may be seen as a black box that takes in much data about design and spits out a bunch of different designs, some of which will be creative or artistic. Consider HCI design more along the lines of architectural design or even photography in that some essential technical skills and principles must be acquired, but ultimately the design is creative.

CONCLUSION

Based on this analysis, we can now identify specific examples of aesthetic considerations within HCI. The results provide a picture of how aesthetics and HCI are related. Aesthetics are considered in various areas of HCI, such as artifact design and research methodologies for gathering user data and assessing artifacts. It is clear from this survey that when the term "aesthetics" is used in human-computer interaction, it is most often about issues of visual or expressive quality. Expressive aesthetics can run into tension with practicality. We think the conflict emerged because we compared the influence of aesthetics on usability while solely referring to visual or expressive aesthetics. Aesthetics as a theory encompasses much more than the superficial or static appeal of user interfaces alone. It describes how one feels when interacting with a system. However, in this scenario, usability is not at odds with the aesthetics of interaction; on the contrary, it is integral to the aesthetics of interaction. Focusing on highly expressive aesthetics at the expense of usability may have a detrimental impact on the aesthetics of interaction and, by extension, the user's emotional response. Consequently, it is up to the aesthetics of interaction to determine where and how expressive aesthetics will be incorporated and how much they will operate in alignment with usability and the overall user experience, thereby favorably affecting the user's mood.

REFERENCES

[1] Du G, Zhang B, Li C, Yuan H. A novel natural mobile human-machine interaction method with augmented reality. IEEE Access 2019;7:154317–30. https://doi.org/10.1109/ACCESS.2019.2948880.

[2] Ding Z, Qiu H, Yang R, Jiang C, Zhou M. Interactive-control-model for human-computer interactive system based on Petri nets. IEEE Trans AutomSciEng 2019; 16(4):1800–13. https://doi.org/10.1109/TASE.2019.2895507

[3] Ding H, Wan Z, Zhou Y, Tang J. A data-driven programming of the human-computer interactions for modeling a collaborative manufacturing system of hypoid gears by considering both geometric and physical performances. Robot ComputIntegrManuf 2018;51:121–38. https://doi.org/10.1016/j.rcim.2017.10.003.

[4] Baskar S, Shakeel PM, Kumar R, Burhanuddin MA, Sampath R. A dynamic and interoperable communication framework for controlling the operations of wearable sensors in smart healthcare applications. ComputCommun 2020;149:17–26. https://doi.org/10.1016/j.comcom.2019.10.004.

[5] Shen T, Afsar MR, Zhang H, Ye C, Shen X. A 3D computer vision-guided robotic companion for non-contact human assistance and rehabilitation. J Intelligent & Robotic Sys 2020;100(3):1–13. https://doi.org/10.1007/s10846-020-01258-1.

[6] Sheron PF, Sridhar KP, Baskar S, Shakeel PM. A decentralized scalable security framework for end-to-end authentication of future IoT communication. Transactions on Emerging TelecommunTechnol 2019:e3815. https://doi.org/10.1002/ett.3815

[7] Tsai TH, Huang CC, Zhang KL. Design of hand gesture recognition system for human-computer interaction. Multimed Tools Appl 2020;79(9):5989–6007. https://doi.org/10.1007/s11042-019-08274-w.

[8] Yu Z, Du H, Xiao D, Wang Z, Han Q, Guo B. Recognition of human computer operations based on keystroke sensing by smartphone microphone. IEEE Internet of Things J 2018;5(2):1156–68. https://doi.org/10.1109/JIOT.2018.2797896.

[9] Alan Dix, et al., Human-computer interaction (New York: Prentice Hall,1993), accessed April 10, 2016

[10] Kou-Ying Huang, "Challenges in Human-Computer Interaction Designfor Mobile Devices," Proceedings of the World Congress in Engineering and Computer Science 1, (October 20-22, 2009), accessed April 11, 2016,http://www.iaeng.org/publication/WCECS2009/WCECS2009_pp236-241.pdf

[11] Alan Peslak, "A Framework and Implementation of User Interface andHuman-Computer Interaction Instruction,"Journal of Information Technology 32Education 4, (2005), accessed April 12, 2016,http://www.jite.org/documents/Vol4/v4p189-205Peslak38.pdf.

[12] S. Greenberg, "Teaching human-computer interaction to programmers.Interactions," 3, no. 4, (1996): 62-76.

[13] G. Strong, "New directions in human-computer interaction: education,research, and practice, Interactions 2, no. 1, (1995): 69-81

[14] MajlindaFetaji, et al., "Investigating Human Computer Interaction Issuesin Designing Efficient Virtual Learning Environments," Balkan Conference in Informatics (2007): 313-324, accessed April 10, 2016, https://telearn.archives-ouvertes.fr/hal-00190068/document

[15] E. R. Tufte, Visual Design of the User Interface (IBM Corporation,Armonk, N.Y., 1989

[16] Jason J. Corso, "Techniques for Vision-Based Human-ComputerInteraction," Phd diss., Johns Hopkins University Baltimore, Maryland, (August,2005

[17] J. Preece, Human-Computer Interaction (Pearson Education Limited:Essex, England, 1994).

[18] G.P. Faconti, "Reasoning on Gestural Interfaces through SyndeticModelling,"ACM SIGCHI Bulletin 28, no. 3, (1996).

[19] A. Newell and S. K. Card, "The Prospects for Psychological Science inHuman Computer Interaction,"Human-Computer Interaction 1, (1985): 209-242.

[20] J. M. Carroll and R. L. Campbell, "Artifacts as Psychological Theories:the Case of Human-Computer Interaction,"Behaviour and Information Technology 8, (1989): 247-256

[21] J. Long and J. Dowell, "Conceptions of the Discipline of HCI: Craft,Applied Science, and Engineering," inPeople and Computer V. Proceedings of the Fifth Conference of the British Computer Society Human-Computer Interaction Specialist Group,eds. A. Sutcliffe and L. Macaulay (Cambridge: CUP,Univ. of Nottingham, 5-8 Sept. 1989)

[22] Huang Y, Cai M, Sato Y. An ego-vision system for discovering human joint attention. IEEE Trans Hum Mach Syst 2020;50(4):306–16. https://doi.org/10.1109/THMS.2020.2965429.

[23] Fang W, Ding Y, Zhang F, Sheng J. Gesture recognition based on CNN and DCGAN for calculation and text output. IEEE Access 2019;7:28230–7. https://doi.org/10.1109/ACCESS.2019.2901930.

[24] Bel´en F, Vallese FD, Leist LG, Ferrao ˜ MF, de Araújo Gomes A, Pistonesi MF. Computer-vision based second-order (kinetic-color) data generation: arsenic quantitation in natural waters. Microchem J 2020;157:104916. https://doi.org/10.1016/j.microc.2020.104916.

[25] Arsalan M, Santra A. Character recognition in air-writing based on network of radars for human-machine interface. IEEE Sens J 2019;19(19):8855–64. https://doi.org/10.1109/JSEN.2019.2922395.

[26] Dometios AC, Zhou Y, Papageorgiou XS, Tzafestas CS, Asfour T. Vision-based online adaptation of motion primitives to dynamic surfaces: application to an interactive robotic wiping task. IEEE Robotics and Automation Lett 2018;3(3):1410–7. https://doi.org/10.1109/LRA.2018.2800031.

[27] Bibi S, Anjum N, Sher M. Automated multi-feature human interaction recognition in complex environment. ComputInd 2018;99:282–93. https://doi.org/10.1016/j.compind.2018.03.015.

[28] Xu S, Liang L, Ji C. Gesture recognition for human–machine interaction in table tennis video based on deep semantic understanding. Signal Process Image Commun 2020;81:115688. https://doi.org/10.1016/j.image.2019.115688.

[29] Ouyed O, Allili MS. Group-of-features relevance in multinomial kernel logistic regression and application to human interaction recognition. Expert SystAppl 2020;148:113247. https://doi.org/10.1016/j.eswa.2020.113247

[30] Shi Y, Zhang Z, Huang K, Ma W, Tu S. Human-computer interaction based on face feature localization. J Vis Commun Image Represent 2020;70:102740. https://doi.org/10.1016/j.jvcir.2019.102740. [

[31] Li X. Human–robot interaction based on gesture and movement recognition. Signal Process Image Commun 2020;81:115686. https://doi.org/10.1016/j.image.2019.115686.

[32] Zhou X, Qi W, Ovur SE, Zhang L, Hu Y, Su H, Ferrigno G, De Momi E. A novel muscle-computer interface for hand gesture recognition using depth vision. J Ambient IntellHumanizComput 2020;11(11):1–12. https://doi.org/10.1007/s12652-020-01913-3

[33] Islam MM, Islam MR, Islam MS. An efficient human computer interaction through hand gesture using deep convolutional neural network. SN Computer Sci 2020;1(4):1–9. https://doi.org/10.1007/s42979-020-00223-x.

[34] Memo A, Zanuttigh P. Head-mounted gesture controlled interface for human-computer interaction. Multimed Tools Appl 2018;77(1):27–53. https://doi.org/ 10.1007/s11042-016-4223-3

[35] Hu T, Zhu X, Wang S, Duan L. Human interaction recognition using spatial-temporal salient feature. Multimed Tools Appl 2019;78(20):28715–35. https://doi. org/10.1007/s11042-018-6074-6.

[36] Roshini TV, Ravi RV, Reema Mathew A, Kadan AB, Subbian PS. Automatic diagnosis of diabetic retinopathy with the aid of adaptive average filtering with optimized deep convolutional neural network. Int J Imaging SystTechnol 2020;30(4):1173–93. https://doi.org/10.1002/ima.22419.

[37] Muthusamy SPB, Raju J, Ashwin M, Ravi RV, Prabaker MLC, Subramaniam K. Synergic deep learning based preoperative metric prediction and patient oriented payment model for total hip arthroplasty. J Ambient IntellHumanizComput 2020:1–11. https://doi.org/10.1007/s12652-020-02266-7

[38] Kelly, M. (ed.): Preface to Encyclopedia of Aesthetics, Vol. 1. Oxford University Press,New York (1998)

[39] Encyclopedia Britannicahttp://www.britannica.com

[40] Zimmerman, J., Forlizzi, J., Evenson, S.: Research through design as a method forinteraction design research in HCI. Proceedings of the SIGCHI conference on Humanfactors in computing systems. ACM, San Jose, California, USA (2007) 493-50

[41] Mankoff, J., Dey, A.K., Hsieh, G., Kientz, J., Lederer, S., Ames, M.: Heuristic evaluation ofambient displays. Proceedings of the SIGCHI conference on Human factors in computingsystems. ACM, Ft. Lauderdale, Florida, USA (2003) 169-176

[42] Schkolne, S., Pruett, M., Schröder, P.: Surface drawing: creating organic 3D shapes with thehand and tangible tools. Proceedings of the SIGCHI conference on Human factors incomputing systems. ACM, Seattle, Washington, United States (2001) 261-268

[43] Hartmann, J., Sutcliffe, A., Angeli, A.D.: Investigating attractiveness in web user interfaces.Proceedings of the SIGCHI conference on Human factors in computing systems. ACM, SanJose, California, USA (2007) 387-39623.

[44] Ivory, M.Y., Hearst, M.A.: Statistical profiles of highly-rated web sites. Proceedings of theSIGCHI conference on Human factors in computing systems: Changing our world, changingourselves. ACM, Minneapolis, Minnesota, USA (2002) 367-374

[45] Ljungblad, S., Holmquist, L.E.: Transfer scenarios: grounding innovation with marginalpractices. Proceedings of the SIGCHI conference on Human factors in computing systems.ACM, San Jose, California, USA (2007) 737-74629.

[46] Buechley, L., Eisenberg, M., Catchen, J., Crockett, A.: The LilyPad Arduino: usingcomputational textiles to investigate engagement, aesthetics, and diversity in computerscience education. Proceeding of the twenty-sixth annual SIGCHI conference on Humanfactors in computing systems. ACM, Florence, Italy (2008) 423-432

[47] . Karvonen, K.: The beauty of simplicity. Proceedings on the 2000 conference on UniversalUsability. ACM, Arlington, Virginia, United States (2000)

[48] Norman, D.A.: The Design of Everyday Things. MIT Press, London (1998)

[49] A. Muhanna, "Exploration of human-computer interaction challenges indesigning software for mobile devices," Master's thesis, University of Nevada,(2007)

[50] B. A. Myerset al., "Taking handheld devices to the next level,"IEEE Computer Journal 37,no. 12, (2004): 36−43

[51] Kevin Curran and David King, "Investigating the Human computerinteraction problems with automated teller machine navigation menus,"Interactive Technology and Smart Education 5, no. 1, (2008): 59-79

[52] Brad A. Myers, "Challenges of HCI Design and Implementation,"Interactions (January 1994), accessed April 24, 2016,http://www.ee.oulu.fi/~vassilis/courses/pui09S/papers/myers-94.pdf

[53] C. Camerer, et al., "The curse of knowledge in economic settings: Anexperimental analysis." J.Pol.Econ 97, (1989): 1232-1254.52.

[54] D. J. Gillan and S. D. Breedin, "Designers' models of the human-computer interface," in Human Factors in Computing Systems: Proceedings of SIGCHI'BO (ACM, New York, 1990)

[55] Nigel Bevan, "Human-Computer Interaction Standards," inProceedings of the 6 th International Conference on Human Computer Interaction ,eds. Anzai and Ogawa (Yokohama: Elsevier, 1995), accessed April 27, 2016,http://www.usabilitynet.org/papers/hcistd95.pdf.

[56] T. J. Howard et al., "Describing the creative design process theintegration of engineering design and cognitive psychology literature," DesignStudies 29 (2008): 160-180, accessed April 28, 2016,http://hci.stanford.edu/dschool/resources/readings/Describing%20the%20creative%20design%20process_DS2008.pdf