

The Significance of the Application Of HCI Concepts and Methods in Analysis, Design and Evaluation of Interactive Technologies

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The Significance of the Application of HCI Concepts and Methods in Analysis, Design and Evaluation of Interactive Technologies

Aryan Grover^a, Shivansh Gupta^b, Prachi Garg^c

^a Vellore Institute of Technology, Vellore, ^bJaypee Institute of Information Technology, Noida,
^c Department of Operations Research, Delhi University

ABSTRACT

Humans interact with computers in a variety of ways, and the interface between them and the devices they use is critical to making this possible. Graphic user interfaces (GUIs) are currently used by desktop programs, internet browsers, mobile computers, and computer kiosks. In speech recognition and synthesising systems, voice user interfaces (VUI) and creating multi-modal and gestalt User Interfaces (GUI) are utilised to allow users to interact with embodied character agents in ways that traditional interface paradigms cannot. In terms of interaction quality and branching, the area of human-computer interaction has progressed throughout time. Rather than developing traditional interfaces, several research areas have focused on problems such as multimodality vs. unimodality, intelligent adaptive interfaces vs. command/action-based interfaces, and active vs. passive interfaces. The study examines the advantages of incorporating human-computer interaction (HCI) ideas and techniques into interactive technology analysis, design, and assessment. The research covers the most recent HCI ideas as well as research gaps identified by different authors in earlier studies. The systematic study of human-computer interaction has probably been the most significant element driving the exponential growth in technology adoption, dissemination, and use, as well as technology-driven productivity improvements that have benefitted a broad variety of companies, during the past two decades.

1. INTRODUCTION

1.1 Context

Human Computer Interaction (HCI) is a fascinating and vital field in computer science. It mixes physical, logical, conceptual, and language-based interactions between a human user and a machine in order to achieve certain goals. HCI is developing, like other areas, to suit contemporary living requirements. At the same time, computer technology advancements are helping to evolve. With the advancement of ergonomics, cognitive psychology, Artificial Intelligence, and other fields in the 1980s, the design and development of human-computer interactions has become one of the most prominent subjects in the computer industry.

SIGCHI was founded in 1982 by the ACM (Association of Computer Machinery). (The Human-Computer Interaction Special Interest Group). Human-computer interaction is defined as "a field concerned with the design, development, and implementation of interactive computing systems for human use, as well as the study of significant phenomena surrounding them," according to the Association for Computing Machinery. [26] Since then, the area of Human-Computer Interaction has progressed for almost 30 years. Meanwhile, new technology continues to emerge, and the disciplines of HCI study have coalesced into a new discipline: interaction design.

The global computer industry has recognised human-computer interaction as a distinct and significant research field. HCI currently encompasses a number of semi-distinct areas of study and practice in human-centered informatics to a large extent[17]. In the computer industry's 90-year history, it evolved into yet another competitive sector. HCI technology led to the creation of associated software and hardware due to advancements in computer technology. It ensures the success of next-generation computer systems.

1.1.1 The History of Human-Computer Interaction technology

1. Interaction between people and computers has gone through many things for social adjustment and computer advancement. The oldest computer in the world was only accessible to experts and it was impossible for the ordinary people to use it. At that time, just a few basic instructions required a highly complicated procedure. This caused a problem: humans could not converse comfortably with the computer.
2. The beginning phase, the starting phase, the expanding phase, and the incremental phase are the four stages of HCI history.
3. The first phase of 1959 was the first article on the computer console, paper design ergonomics, which was designed by B.Shackel, the American scientist. In fact, manipulations of the computer decreases tiredness paper suggested to a human-machine interface. His results marked the start of his growth in this field.
4. Two significant occurrences took place between the foundational period 1970 and 1973: First, four computer ergonomic monographs were written and a significant number of excellent suggestions provided by many academics. Secondly, two HCI Research Centers have been set up and contribute much to the future growth of the research.

The stage of growth: A number of academics produced 6 volumes of their study findings in the 1980s in the eighties of the 20th century. In 1980-81 three meetings were held in England to discuss the many academic issues involved. The HCI was the most essential element, which therefore was a theoretical system and architecture.

The phases of growth In the 1990s high processing chips, multimedia technologies and the like were developed extensively. HCI emphasizes the intelligence research "humans at the centre." The way people communicate with people is like the interactions between human beings and machines.

1.2 Aim and Purpose

With individuals continually increasing their need for quality of life, for security and comfort in their family life. With science and technology advancement, personified and user-friendly design in a smart home, and the people were also progressively familiar with it.

A human-computer interaction research will focus on how people interact with technology in order to make human activities more efficient and helpful. Our study demonstrates how computer systems and other technological systems are designed to operate efficiently and provide a pleasant working environment. For working lives such as lamps and voicing we have used our study.

HCI aims to create useful, safe and useful systems.

The main work is as follows :

1. Theoretical background and investigations on HCI.
2. Applying theory in the Smart House and investigating HCI in our Smart House.

1.2.1 Theoretical and Application

As a separate realm, human computer interaction is significantly distinct from conventional media. It is the study of how people interact with computers and how computer systems are designed to be user-friendly, fast, and productive. It is important to understand customer needs and to investigate and analyse consumer's wishes. Usability features like multi-touch, clever, concise, news, interactivity and others have become more popular. In our system, several of these components are used:

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1. **Intelligent:** In order to be intelligent, this project relies on feedback data. This project will provide information feedback while evaluating intelligence initiatives. For example, if the user selects one of the devices, the system will display a pop-up window informing the user of the thermometer's temperature.
2. **User-Friendly Interface:** The project's concise interface is user-friendly, and there are many interfaces for concision. A decent user interface makes it simple for the user to understand how to utilise the system?
3. **Interaction:** Many presentations nowadays are non-reciprocal and a one-way communication method. Contact and communication with computer technology is referred to as interactivity. It enables a computer's equipment to comprehend human activities. "Touch to choose," "text to speech," and "menu" will all be used in our project. This enables the client to get a better understanding of the control information. A smart home is a home type that includes lighting, thermometers, sound equipment, and other amenities that can be controlled through an app and are connected to each other. It's comparable to Arduino, but it's a lot more useful. It has a lot of the same capabilities as Arduino.

You can control the many gadgets in the home using a separate connection. The designer will develop the smart home software using the Arduino IDE, which will allow the smart home to interact with our server. More Arduino information is available.

2. REALIZATION OF HCI

2.1 Three components of human-computer interaction

In general, three components must be considered for a successful interactive system: human factor, interaction device and interactive software. The scheme of the interactive system (see Figure 2.1) is shown in the following figure:

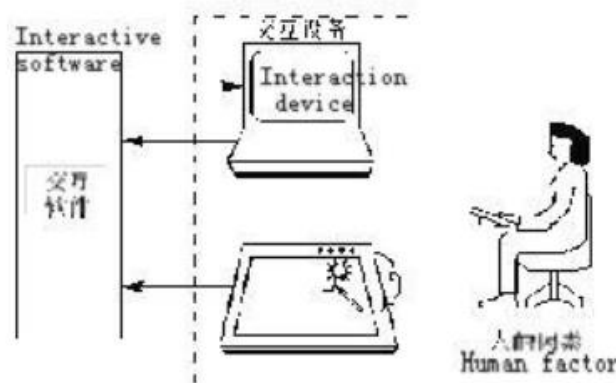


Figure 2.1 Interaction system

2.1.1 Human Factor

An interactive computer system is intended to enable users to perform an interactive process. You need to consider users' requirements while developing an interactive computer system. An essential component of any interactive computer system is the human aspect. The three kinds of model of human behavior: manual control, management control and surveillance.

Generally, a human component is an individual or a societal behaviour physical or cognitive characteristic that is unique to people and that affects the work of technology and human-environmental systems. [27] The user operation model is the human aspect. The link between gender, age, occupation, income and psychology is the demography of the user. It is all about how consumers perceive, utilise and deal with goods. It's a long-standing

project. The demographics of the user do not affect the user much. The objective of the user model is to better understand the requirements and variability of the user.

This information shows that the project must take into account the client's needs in order to develop a decent user interface.

2.1.2 Interaction device

Connection device is a kind of gadget that allows for direct human-computer interaction. The gadget takes human input and may provide human output. [2] .

Interaction device is an interactive computer system material basis. It refers to the input and output devices. Dialogue, handwriting or drawing is the most frequent form of communication. In order to get the greatest impact, interactive gadgets must consider the following qualities. Input utilises dialogue, manuscript or drawing, and output utilises the picture, language, text, etc.

The touchscreen phone is used as an interactive device in this project. Either an input device or an output device may be a device. Use the interactive gadget to place all types of data in the system.

2.1.3 Interaction Software

Interaction software is the basis for presenting interactive components of various sorts. It works like a "soul," which links gadgets and people. The software may be split into two software types: system software and software applications. The interface between human and computer has become one of the most important elements in the software application aspect. Currently, a menu choice is the most common approach since the option is offered to prevent the user from saving anything. The "direct operation" is another method to allow user data to be entered to the screen. The information is feed-backed to the screen after system execution. Many people enjoy this style; therefore, it is developing quickly.

2.2 Human-computer Interaction Model

The human-computer interaction model is a model design to describe the method for interaction in HCI systems. Many models, such as user models, human-machine interface models, interaction models, etc have currently been created by humans. The following topics will explain various interactive models that may help you understand how our project is interacted, organized and developed. In order to explain the characteristics and behavior of a human-computer in a process of interaction, various models are looked at from various perspectives.

2.2.1 Human-Computer Interaction Model

In human-computer interaction there are four phases: establishing objectives, articulating, presenting, and monitoring. These four phases constitute a more linguistic procedure. In the meantime, it is necessary to comprehend the user purpose in the first two phases and to explain and evaluate system output in the last two. The user utilises the brain's user language. And you may utilise keyboard and mouse input to transmit "input language" to the recognizable computer. The software then does a number of procedures termed kernel language. After the value is calculated and changed, the "exit language" (for example, pictures, text, etc.) is displayed in order to identify the user. The user examines the result during the final observation phase then compares it with the original objectives.

- The interaction between humans and computers is a language between the interactive human being and machine. It's a procedure that is needed in order to fulfill the computer-human flow of information.
- This model is required to represent both system and user features in the interactive system. It consists of four parts: interaction:
 - User(U) - Uses the language of your work (psychological attributes related to user state)
 - Input(I) — The language of the input is

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- System(S) - Uses the main language (computational attributes related to system state)
- Output(O) - uses the language of its output
- The generic features of the interaction reflect this interactive paradigm. It helps us understand what occurs throughout the interaction between the user and the system. The interactive model manages the conversion between the desired and the system
- The user/system dialogue influences the style of the interface.
- Input and output are paired to create the interface between the human and computer (also called the user interface).

2.2.2 Interactive model for Object-Oriented user Interface

The common Object-Oriented user Interface Interaction Model includes the MVC model, the PAC model, the PAC- AMODEUS model, the LIM model, and the YORK model. This project relates to the MVC model. Model-View-Controller is a software design for interactive computer user interfaces that separates the representation of information from the user's interaction with it.[28]

The Model View Controller this model was first explored in 1983. The model was composed of three objects: the “model”, the “view”, the “controller”. (see Figure 2.2.2)

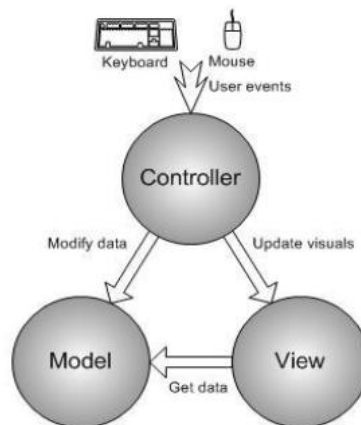


Figure 2.2.2 Model View Controller

1. View: A view can be any output representation of data, such as a chart or a diagram.[28] Responsible for the description of the visualization features, such as Text View, Form View, ListView, and so on. It will render the model to the screen.
2. Controller: A form of input equipment that handles user interaction and provides user interface tools.
3. Model: It expressed the behaviors and state attributes of the application object, it used to represent the component of the interface model of application field knowledge. It contains the data portion of a diagram.

This project controller and view may be controlled and received using a cell phone. Our system works by input, the model reflects our system. The reaction and event of our Smart House initiative, for instance. The features of this model communicate directly with each other in accordance with semantics and their views.

2.2.3 User conceptual model

Some HCI scientists are interested in user modeling since user models are likely to enhance the collaborative nature of human-computer systems

The user can comprehend this kind of system description. It employs an integrated collection of ideas and concepts. What is the way it operates and how it looks and so on? What does? Models are employed to capture the present system's importance. Models will remove what is irrelevant. This may frequently be a problem since a user may believe something that is abstract is essential. [13] HCI's initial goal is to develop a highly precise conceptual model so that goods with additional criteria are developed according to the user's demands.

Do you want a digital house? The project goal is to design a smart house assuming that the user needs it. That will be the project research aim.

2.3 Human-computer interaction and Human-computer interface

Interactions between human-computers and interfaces between people and machines are two ideas that share yet are distinct.

The interaction between the person and the machine is human-computer interaction. In essence, it is human-computer interaction. Human-computer interaction research skills and issues with interactive computer system design, assessment and implementation. The interaction between human and computer has greater significance than the interface between human and computer. The interaction between humans and computers concerns the interaction between humans and the computer, of course, the creator must utilise the user interface to finish it regardless of how they interact.

The interface between human and computer the flow of information is described as an interaction loop between humans and computers. [25] The interface between humans and computers is called the user interface. The interface product human-machine consists of hardware and software. The media may communicate with a computer between the user and the system. It is a two-way information software and hardware support. The interface that can perform the interaction between human and computer is termed the interface between human and computer.

However, the interaction and interface in the product design system are only one way of managing the computer relationship, which is not the final outcome, but the final objective is to fulfill and solve human needs.

2.3.1 Development of Human-Computer Interface

The interaction between the human-computer and the interface between man and machine are two concepts that are closely related but which vary.

The interaction between person and computer is a human-machine interaction. It essentially involves human-computer interactions. A new understanding involves human interaction with a computer. Interaction between human and computer research relates to skill and issue with interactive computer systems design, assessment and implementation. Interaction between human and computer has greater significance than the interface between human and computer. Human-computer interaction is anxious about the interaction between humans and computers, of course, regardless of how the designer interacts the user interface.

The interface between human and computer may be defined as the communication point between the user and the computer. Interaction is defined to be the exchange of information between the person and the computer. [25] Interface between human and computer is sometimes termed an interface for users. The product interface human-machine includes hardware and software. It is the medium which can communicate with a computer between the user and the machine system. It is a two-way information support software and hardware. The interface that can carry out interaction between human computers is termed the interface between human computers.

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However, interaction and the interface are merely in a product design system, which does not represent the end outcome and the ultimate objective is to meet and respond to human requirements. The link between man and computer.

1. Graphical user interfaces phase.
2. The emergence of the web user interface.
3. Multi-media interaction (MMI) phase.

3. ANALYSIS AND DESIGN

3.1 Human-Computer Interaction interfaces Design

The design of the human-computer interface should allow people to understand the system (i.e. mental model). This allows usability. The interactive design is designed not only for the interaction of the machine or program but also for the behavior and contents of humans. Interaction design is human-centered design. Interaction design Mitch Kapor, Software Design Manifesto 1990 reminded us that designers were supposed to start by taking things into account for people rather than first examining how they were created. They're excellent at producing things in this manner. Clear mental model, navigability, coherence, intuitive interaction and comforting feedback should be included in the excellent design.

3.2 Interaction Design

People often question if interaction design is the same as interface design? The design of places of human communication and interaction is described by Winograd(1997). Interaction design focuses more on the interaction process and interaction between user behavior and product. Interaction design. The interface component may be considered to serve interactive conduct. Interface design, on the other hand, contains interactive design. The designer means interactive goods designed to help people in their daily and professional lives[20]. The interaction design creates the bridge for communication with the user when the interface design opens the door to the user. A friendly system design makes the system simple to operate and offers a pleasant experience for the user. If it isn't, the conceptualization of interaction doesn't provide a hint and keeps the system at a respectable distance.

3.2.1 Interaction design goal

Without clear goals, everything is non-directional and gets twice the result with half the effort. The product's primary function is to meet the user demand. The interaction design goal is to let the user complete the task or study more conveniently, more comfortably, and more effectively. These goals can be divided into "usability goals and user experience goals".

3.2.1.1 Usability goal

Usability is one important consideration in human-computer interaction. Usability is the quality of the user experience metrics when the user interacts with a product or system (Usability.gov, 2006). Usability is a quality attribute used to evaluate the extent of the user interfaces easy to use or not (Nielsen, 2003).

Usability is the extent to which a product can be used by specified users to achieve specific goals with effectiveness, efficiency and satisfaction in a specified context of use (ISO Standard 9241-11,1998)[16]. It involves optimizing the method of interaction between the human and the product, so that people can be effective in a day-job, completing tasks and studies. The usability goal may be divided into the following:

- Usability: for users acquainted with the app, the usability of the program will be steady. Is it requested by users?
- High efficiency: the processing time is minimum. Switch function, for instance.
- Generic: It has excellent flexibility, different people have different cultures, they all can use it. In other words, whether the system provides the appropriate function or not, it allows users to complete the task in their own way. For example, our system has two interfaces that allow the users to switch to what they like.
- Learnability: Learnability is the difficulty of learning to use the product. It should be easy to learn for new users.
- Easy to remember (Memorability): Easy to use the system to complete the task. Memorability refers to how, after learning a product one can quickly think back to how to use it again. There are many ways to increase the Memorability. For example, at different stages of implementation tasks, using meaningful icons, names, or options to help users remember the operating sequence.

These standards measure whether the product is usable.

3.2.1.2 User experience goal

New technology has penetrated into people's daily life in many aspects. Humans have more demands for the product, and interaction design is not just improving efficiency and productivity. People are concerned about whether the system has other qualities. That's what makes researchers and industry think more about further goals, such as:

- Satisfactory
- Pleasant
- Interesting
- Fascinating
- Useful
- Enlightening
- Aesthetic
- Can stimulate creativity
- People feel successful
- People's emotional requirements to be met

Design of interactive products: In order to make products with the above characteristics, its main purpose is associated with the user experience. For example, our project's major consumer group is ordinary people, and its main goal is creating an aesthetic feeling and use. User experience means how the user feels while interacting with the system.

In a comparison of the usability object with the user experience object, usability object is the core of interaction design. Usability objects use specific measurement criteria, and the definition of user experience object is not so clear.

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3.3 Interface Design

The main issue for the implementation of the HCI is the design that develops and finally implements solutions in reality, according to the different needs and requirements of users and tasks. HCI is crucially designed[19]. Each designer is aimed at software that is easy to learn, simple to use and efficient and is tightly connected to a well-designed human-computer interface. The design of the interface between the human-machine must take into account not only the various users, applications and goals but also the interaction and other elements like information visualisation and data input. Any kind of software design has to take into account its usability, and the aim is to create a human-computer interface.

3.3.1 Human-computer interface user requirements analysis

The first stage of a well-designed human-computer interface is a thorough knowledge of users. Different users have different experiences, abilities, skills and interests. Computer knowledge and skills are also different. The way they handle the interplay of multiple variables is thus different. For this reason, first must know all aspects of the characteristics of user behavior. Then establish the corresponding user model.

Through the analysis of user characteristics, it will be able to have a detailed understanding of the user in skills and experience in a field. It makes the system more able to understand the user's intent based on the user model. The user analysis is an indispensable part of human interaction design. Different researchers have different classification methods for the user.

According to whether the user has computer systems knowledge training, they can be divided into un-trained users and trained users. According to the frequency of computer system use, they can be divided into occasional users and regular users.

After having a deep and clear understanding of the product of the target customer, then determine the target customer. The design result does not need to be overly complex, just concise.

The main operating style looks at user requirements for easy operation and easy to remember.

The project must complete the intelligent home, but must also communicate with the user. User operation enables them to better grasp how equipment may be controlled.

According to this information, the project will achieve the information with user expectations in this project

1. Simple interface
2. Nice and Aesthetic Graphical interface
3. A simple method of operation (single-finger touch)
4. Feedback

3.4 Human-computer interaction touch screen

How does the human interface vary from what people term the Touch screen?

"Touch screen" is just part of the hardware that may be utilised in the interaction between the human and computer. It is a mouse and keyboard replacement input device. On the other hand, a human interface device includes software and hardware and is a human-computer interaction device.

The tactile screen is becoming a popular alternative to keyboards and mouse input devices via the development of human-computer interaction technologies. In many cases and areas, it has been utilised. Touch technology allows people to communicate with one another via touch gestures and computer gadgets. Interaction between computer equipment and operators via finger-drawing paths on the touch screen allows it to be accomplished. The input of touch gestures compared to the conventional mouse and keyboard provides more direct contact between people and computers, with a distinct benefit in many ways. First, they fulfill the everyday needs of people more and may use natural motion to manage computing equipment. It is easy for the operator to utilise. Secondly, it doesn't have to have an accurate positioning menu or a mouse button, use the finger to draw the appropriate action. This enables individuals to effortlessly utilise computers and other devices. Using touch motions, the menu and number of buttons may be reduced and the screen area can be increased. Touch gesture technology makes human-computer interaction more intuitive, easy, and natural.

3.5 Theory Model

Before starting to design the project, there are several aspects that must be considered that will affect the quality of designs.

1. Product's target users
2. People's learning curve for adaptation.

The analysis makes the above points clear. So, you will see a project design for most people to use. It must meet the above requirements, which describe a beautiful interface, touch operation, generality, and high efficiency.

Through this research, the design learned that the design interface also involves human psychology and color psychology. Through the simple search, the writer came to understand that person's perception of the external world comes 70 percent from the visual [11], consequently, color for the human psychological and physiological effects cannot be ignored. Analyzing and understanding that yellow, blue and green do not easily cause visual fatigue is vital.

The warm tones give a warm feeling. The project will use this thing to design the beautiful interface so that it can achieve several user experience goals such as satisfaction, aesthetics, and people's emotional requirements to be fulfilled.

Touch operation is used by many people, it is not a stranger to humans, the project will use a listener in Android to accomplish the phone listening to user gestures. In view of easy to learn, easy to remember, use and everyone are satisfied. Advantage of menus is that it is easy to remember, and the direct operation develops because of ease of operation and high efficiency. So this project design has to include menus and direct operation.

The project uses the Android SDK in Eclipse to develop the software. According to the above requirements. The project will design two operation modes:

1. The picture as the background and component. Then you can direct the operation by touch.
2. Table system that is made up of several lists.

This is so that different groups of people can use this software. When the user enters the interface, they can then select which operation mode they like. The software main operating method is touch, it can be used by more people. It is more convenient for people with disabilities.

There are 3-6 interfaces: the main interface, the negative interface, the room interface. By the user operating the interface can switch.

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First, the user will see a house interface to the door when he clicks the interface and enters the system. Of course, this consists of a beautiful picture. It will enter another interface when the user touches his finger to the door. After the user chooses the door and enters the room, he can see a lot of equipment around the room. You can imagine it is like a Google map. You can switch the view to see the whole room (see Figure 3.5).

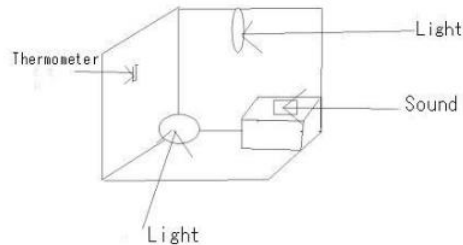


Figure 3.5. The base model

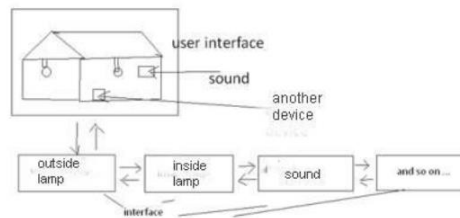


Figure 3.5.2. Design model (Smart house analysis diagram)

In that form of interface, a drop-menu can save screen space. So, you will use the drop-down menu to make a simple and friendly interface. After all, phone screen space is limited.

Each drop-down menu will be displayed in this room and all devices in this range (see Figure 3.5.1)

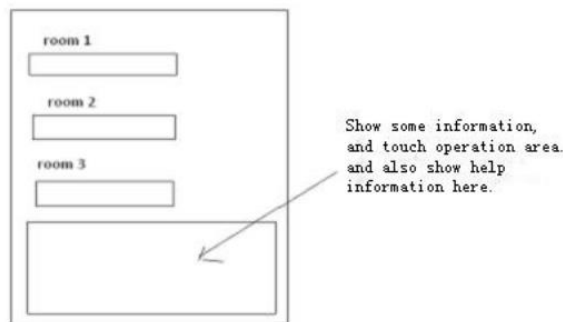


Figure 3.5.1 another interface

4. REALIZATION OF APPLICATION

First, the project will create the interface with HCI technology. Then, you should be able to see the house on the mobile phone. The house will have some rooms and each room will have many different devices (lamp, thermometer and sound) in different locations. In the interface, the user can operate many lamps and other devices. When you use HCI in the system, it will make the user interface friendly and easier to understand. Second, to make this system can be communicated with devices. Finally, upload system to mobile phone.

4.1 Choice of Solution

The project intends to use PhotoShop to make the background. It will make the UI more beautiful and provide better user experience. This project will be going to set the graphical layout for absolute layout. That way, all the components can easily be arranged and moved.

According to statistics, in order to facilitate and practical, this project use a single finger touch to achieve operation. In order not to make the interface looks boring or single, the project chose ImageView component as a button. Then realize the ClickListener of imageView.

According to the user's requirements, the project use Quick operation. The project uses the Android component of the spinner to complete it. The Spinner is a drop-down menu options bar. Here, writer worry that if a lot of equipment in the room, that drop-down menu will be so complicated, it may as well have been searching for devices directly. Such as the picture below,



Figure 4.1. project

4.2 User Interaction Satisfaction Questionnaire testing

4.2.1 Evaluation implementation framework

1. Evaluation overall goal

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The goal of this test is to test the user's satisfaction with software, specifically including the human-computer interaction interface's visual clarity, consistency, learnability, flexibility, the user guide, and other performances. Through the test to find out the deficiencies of the system and the areas that need improvement.

2. Questions to be answered

Visual Clarity

1. Did the application of color make the display clearer ?
2. Was it easy to find the information which was needed on the screen ?
3. Was the information on the screen logical ?

Consistency

1. Were the menu words and command language consistent ?
2. Were the system requirements the same as user action ?
3. Was the feedback information correct ?
4. Is the term clear ?

Flexibility

1. Does the system have the function of direct operation ?
2. Could the user easily control the display ?
3. Could the user change his vision ?
4. Does it offer the menu ?
5. Does it offer suitable feedback information ?

Through the analysis of the problem above, the project will use the Questionnaire to enhance user interaction satisfaction.

4.2.2 Organization Test

The project will design the user interaction satisfaction questionnaire and answer sheet as follows:

- Compatibility
- Design consistency and standards
- Learnability
- User guide
- System Availability
- The quality of the user interface
- Quality of information

4.2.3 Satisfaction questionnaire

The project conducted a satisfaction questionnaire in the network. This file will record your feelings about the tested system so that the designer can understand your satisfaction with the system to help improve the design. The answer will represent your personal point of view. Answer the questions according to the facts.

1. Does it provide the appropriate feedback?
 Yes, have feedback Not bad Not enough
2. Do you think the interface design is beautiful?
 Beautiful, I was impressed Neutral, do not feel anything Ugly, I do not like it
3. Is the display of the content of the screen too dense?
 Will not bring trouble Neutral, and sometimes not easy to find Too many things and inconvenient
4. The writing and color are clear and easy to identify?
 Clear and easy identify Neutral, did not pay attention to it Not clear enough, makes the eyes uncomfortable.
5. Is it providing a search function? If yes, is it helping you?
 I often use search, find it to be useful Sometimes, but not helpful NO
6. Is it providing all the information that you expect?
 Yes Not bad That is not what I want
7. Is the function used flexible and convenient?
 Easy operation Not bad Inconvenient
8. What other features should be added to the system?

5. RESULTS

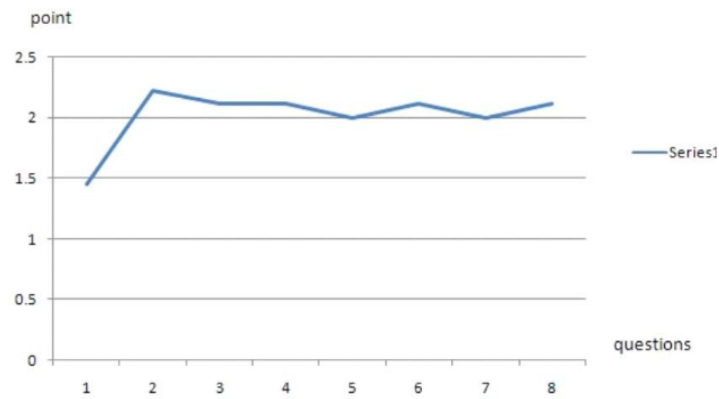
5.1 Smart House user satisfaction analysis

This test has 8 questions. The writer asked 9 people. Each subject has three answer choices: "1" represents very poor, "2" represents neutral, "3" represents very good. If the statistical average is over 1.5 that means the user is satisfied. Anything less than this value means that the system in this area doesn't meet the requirements of most users. The last question requires users to seriously consider and put forward constructive suggestions.

User satisfaction answer diagram

	A	B	C	D	E	F	G
1	1	3	2	2	2	2	2
2	1	2	2	2	2	3	2
3	2	2	2	2	2	2	2
4	2	3	2	2	2	1	2
5	2	2	2	2	2	2	2
6	1	2	2	2	2	2	2
7	1	2	2	2	2	2	2
8	1	2	3	2	2	3	2
9	2	2	2	3	2	2	2
10	1.444444	2.222222	2.111111	2.111111	2	2.111111	2

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On average, five questions exceeded two. Only one issue was not 1.5. The second issue "Do you believe the interface design is attractive," averaging 2.22, was the highest value. This shows that the design is pleasant and user friendly. The first question "Does it provide proper feedback" was the minimal value. It was less than 1.5 on average of 1.44. This shows that most people are not pleased with their feedback. It represents the inconvenience of the intelligent home.

In short, many users believe that in a smart home, the project may supplement practical equipment. It would be great if the user can relocate gadgets in an intelligent home. In general, though, smart home customer satisfaction is excellent. All in all, it satisfies the user's needs.

5.2 Discussion about Restrictions

Handheld mobile devices have difficulty with a tiny screen. The application development of these devices was stopped by that issue.

It is very uncomfortable to surf a mobile phone on a tiny screen. It needs to enhance its efficiency and naturalness. Physical size and interaction equipment are restrictive and influence efficiency and naturalness directly.

If the user wants to browse, he or she frequently has to scroll to find the data he or she seeks. This procedure must be repeated throughout the reading process. This lowers not just the surfing efficiency, but also the readability of the user. Therefore, it is an essential problem to design a mobile phone in order to increase efficiency and decrease user loads.

The author has developed an excellent technique that combines a thumbnail, zoom tools, and other ways to facilitate browsing for users. If screen clarity is not sufficient, the designer may zoom in and zoom out. The menu bar and sub-menu may be used by the designer. In this manner, the individuals may always utilise it and guarantees that the contact is natural.

6. CONCLUSIONS

HCI progress has been quick: the shift is significant from the beginning of computers with complicated instructions to contemporary desktop operation and voice operation. It was one of the world's leading research projects, and HCI will thus be utilized as a research project.

This paper introduces some knowledge of HCI, but the writer knows that HCI is a comprehensive field and its development requires a joint effort from computer hardware, software, network, cognitive psychology,

ergonomics, and other disciplines. Under-standing in the broad sense focuses on the user experience. Combining the HCI model and HCI interface design research and analysis, the writer knows the usability goals and the user experience goals. Understanding HCI with the intuitive significance means it is interaction with the computer and the machine: Keyboard Input and touch operation. Our research is interacting with the interactive house by touch.

The user-centered design of HCI was stressed. One must initially put the user in every stage of creating goods. The writer has therefore researched user experience and evaluated user needs for human-computer interfaces. At the conclusion of the article, the author conducted a user satisfaction test and the findings of the research showed that our project was excellent and usually fulfills the requirements of users.

Research and industry have seen considerable progress in human-computer interaction. Writers need to understand the truth, boost investments, and reinforce collaboration with the global HCI research community. HCI has established a new scenario for HCI with vigorous development. In HCI studies, issues and research in the design of human-computer interfaces are equally significant. The writer expects an increase of ambitious individuals who will continue to build a new HCI sphere.

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