

**FR. CONCEICAO RODRIGUES COLLEGE OF  
ENGINEERING**

Department of computer engineering

**HUMAN MACHINE INTERACTION**

**COURSE OUTCOMES**

**RUBRICS FOR EVALUATION**

<b>Performance Indicator</b>	<b>BS- Below standard</b>	<b>MS- Meets Standard</b>	<b>ES – Exceeds Standard</b>
<b>Contextual Inquiry (2)</b>	Does not have any idea about the client or existing applications (0)	Research on existing Applications done. Does not give too much importance to the particular client/ user (1)	Research on the users' behaviour, interests and their requirements. Has knowledge on such existing applications (2)
<b>Design of user interfaces (2)</b>	Design is not tied to findings from Contextual Inquiry, or other research (0)	Most aspects of the design are tied to contextual findings and research. (1)	Design is completely tied to contextual Inquiry, and research (2)
<b>Follows HMI design principles</b>  <b>(Visually pleasing composition, logical navigation, use of proper color, focus, grouping, contrast etc.)</b>  <b>(2)</b>	None of the design principles followed. Interface is difficult to use because of demands on memory, learning, or the visual/auditory/motor system (0)	Applied few of the design principles. Interface does not place much load on memory, learning, or the visual/auditory/motor system (1)	Understood and applied all the general design principles. Overall the design is good and innovative. (2)
<b>Test Cases and conclusion</b>  <b>(2)</b>	Usability test not been conducted (0)	Usability test conducted and derived appropriate conclusion from the test (1)	Usability test conducted with all the design aspects covered during the test and derived appropriate conclusion. (2)
<b>Post Lab Assignment</b>  <b>(2)</b>	Answers are irrelevant to the question or the problem (0)	Basic points have been covered but not in detail (1)	Basic points covered with appropriate justification (2)

**Department of Computer**

**Engineering Academic Term:**

**Jan-April 2021**

**Class : B.E Computer Sem -VIII**

**Subject Name : Human Machine Interaction**

<b>Practical No:</b>	<b>1</b>
<b>Title:</b>	To understand the trouble of interacting with machines - Redesign interfaces of home appliances like microwave oven, land-line phone, fully automatic washing machine.
<b>Date of Performance:</b>	31-01-2022
<b>Date of Submission:</b>	31-01-2022
<b>Roll No:</b>	8591
<b>Name of the Student:</b>	Simran Biswas

**Evaluation:**

<b>Sr. No</b>	<b>Rubric</b>	<b>Grade</b>
<b>1</b>	<b>Contextual Inquiry (2)</b>	
<b>2</b>	<b>Design of user interfaces (2)</b>	
<b>3</b>	<b>HMI design principles (2)</b>	
<b>4</b>	<b>Test Cases and conclusion (2)</b>	
<b>5</b>	<b>Post Lab Assignments (2)</b>	
	<b>Total Marks awarded: (10)</b>	

**Signature of the Teacher : \_\_\_\_\_**

**1. Aim:** To understand the trouble of interacting with machines - Redesign interfaces of home appliances like microwave oven, land-line phone, fully automatic washing machine.

**2. Objectives:** From this experiment, the student will be able to

- To understand the importance of human psychology in designing good interfaces.
- To encourage students to indulge into research in Machine Interface Design

**3. Outcomes:** The learner will be able to

- Apply HMI in their day – to – day activities.
- To analyze the local and global impact of computing on individuals, organizations, and society.
- An ability to recognize the need for, and an ability to engage in life-long learning.

**4. Hardware / Software Required:** Any tool or technology can be used for implementation e.g., VB, DOTNET, JAVA, PHP, etc.

## **5. Theory:**

Human-machine interface (HMI) is a component of certain devices that are capable of handling human-machine interactions. The interface consists of hardware and software that allow user inputs to be translated as signals for machines that, in turn, provide the required result to the user. Design is concerned with how things work, how they are controlled, and the nature of the interaction between people and technology. When done well, the results are brilliant, pleasurable products. When done badly, the products are unusable, leading to great frustration and irritation. Or they might be usable, but force us to behave the way the product wishes rather than as we wish.

Two of the most important characteristics of good design are *discoverability* and *understanding*.

- **Discoverability:** Is it possible to even figure out what actions are possible and where and how to perform them?

- **Understanding:** What does it all mean? How is the product supposed to be used? What do all the different controls and settings mean?

With complex devices, discoverability and understanding require the aid of manuals or personal instruction. We accept this if the device is indeed complex, but it should be unnecessary for simple things.

## **Fundamental Principles of Interaction**

**1. Affordances:** Convey the rules by leaving visual clues. To make sure that the

appropriate actions are perceivable, and non-accessible ones are not invisible. By just the appearance of any object, its functionality must be clear to the user.

Example: by looking at the handles, we should know how the door opens.

**2. Signifiers:** This is a physical form of showing the functionality to the user, such as a sound, printed word or image.

Example: writing word “PUSH” on a door is a clear way to tell the user that door will open when pushed.

**3. Feedback:** The effect of every action. A feedback in any form is very critical to the user.

Example: washing machine example, the user did not get any kind of feedback from the system. That made the user assume the system is faulty. Every single user action has to be acknowledged immediately.

**4. Constraints:** Prevent the user from making mistakes. Instead of having an option for the user to make a mistake and then forgiving them, make sure your user can never make a mistake.

Example, you want your user to enter a date. Show a pick-n-click calendar instead of a textbox. This will eliminate all possibilities of syntax mismatches

**5. Mapping:** Mapping gives the set of possible relations between objects. There should be Control-display compatibility between the objects visible. Mapping gives the natural relationship between controls and displays. Example: mapping of stove controls to elements.

## Conceptual Model

☐ **Conceptual models** define a good design as the communication between the designer and the user. The designer must be able to explain the entire product to the user by just appearance of it. These models are very critical for a good user experience. If the end product does not map to the mental images of the user, the product is not a success.

☐ A **mental model** is an explanation of someone's **thought** process about how something works in the real world. It is a representation of the surrounding world, the relationships between its various parts and a person's intuitive perception about their own acts and their consequences .

## 6. Procedure:

Select any home appliances like microwave oven, land-line phone, fully automatic washing machine and understand the trouble of interacting with that machine.

Comment on design of that machine as good or bad design based on whether interaction principles are matching with users mental model or not. Redesign the

interface to mention the change in design and reason.

→ **Designing the interface of Washing Machine for better human machine interaction.**

Domestic appliances, especially washing machines, have dramatically changed their design features over the years. Designers and engineers have been developing several models of washing machines trying to highlight the evolution and importance of specific functions, such as introducing ecologic, energy-saving programs.

Nowadays these kinds of appliances have improved automatic controls in order to reduce supervision. Low-end users usually cannot tolerate complicated operations. And the ease of use design should be visualized with easy-to-understand interface operation mode, realizing human-computer interaction to provide a humanized design.

In this design proposal,

Plan One: “geometry” is to make innovative attempts on the interface and operation modes, as shown in Figure.



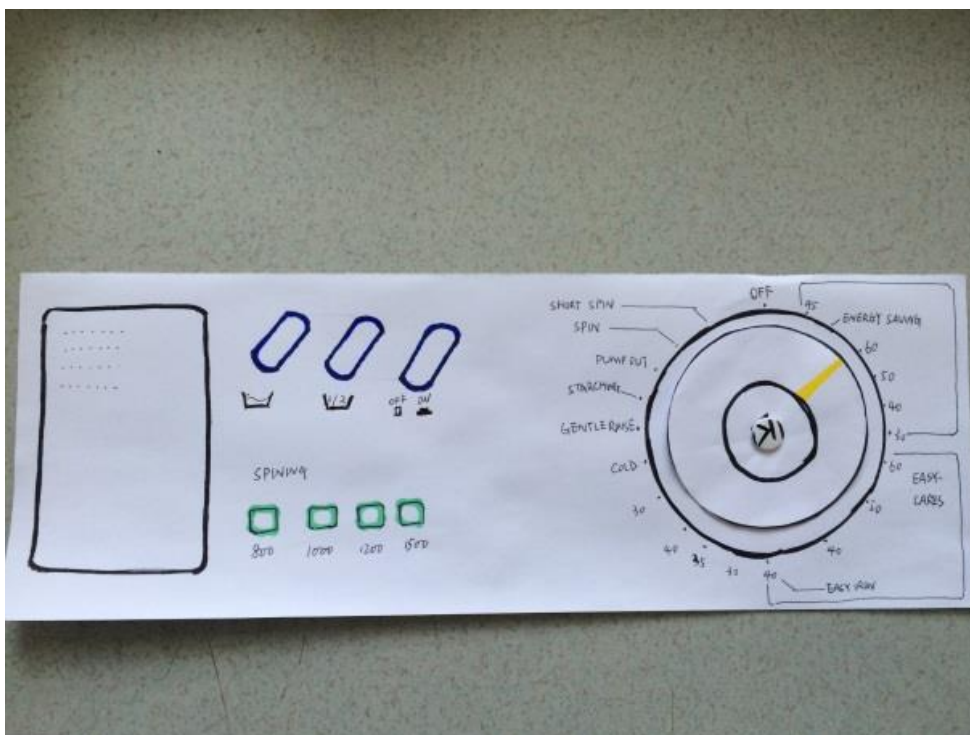
This design makes full use of the oversized panel of a fully automatic washing machine, combined with current flat panel technology, to make the laundry process more joyful. At the same time, in the design of the icon, the existing text based format is abolished, being replaced by large icons with greater visibility, and one-click intelligent processing. On the other hand, it allows users to operate easily without instruction books, and is particularly suitable for consumer groups with low education levels in the middle-and-low-end markets.

Plan 2: On the other hand, we can make use of **Braille**(universally accepted system of writing used by and for blind persons and consisting of a code of 63 characters) which facilitates visually impaired people.

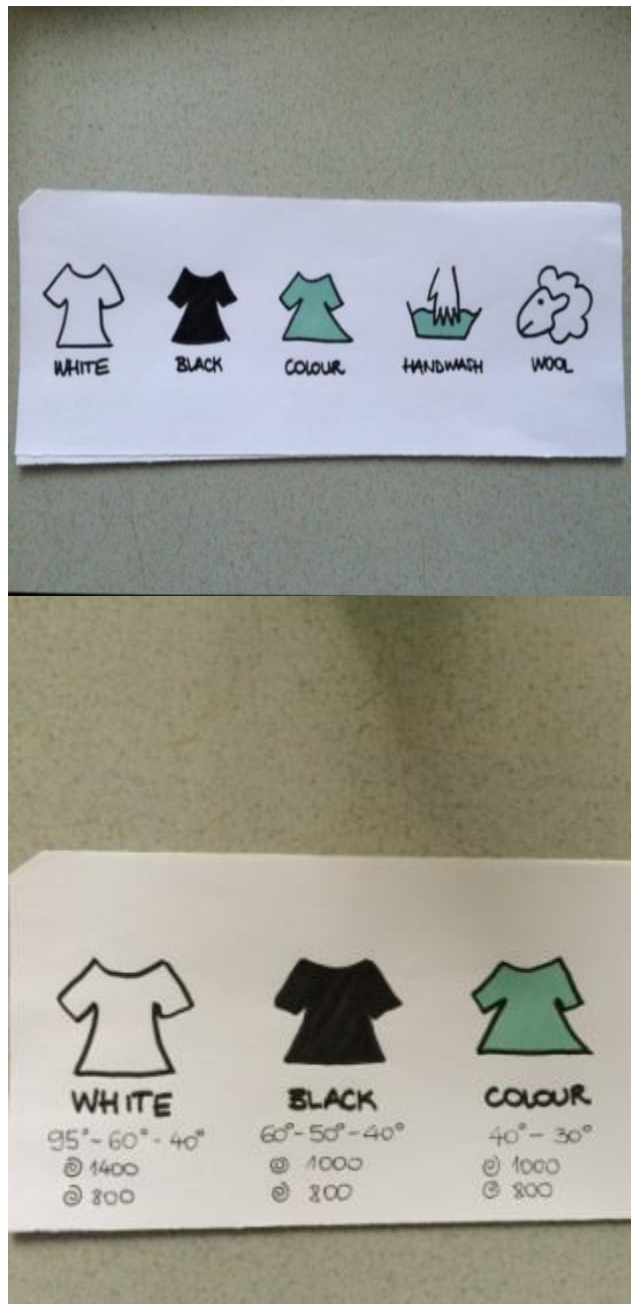


### Design Process:

- We imagine that washing machines are a today's necessity but most of the actions are confusing and lead to misinterpretation of different programs. Our goal was to make a clear interface to get rid of all the buttons and turning wheels, to make a more understandable and pleasant experience. Since the introduction of smartphones people are really used to a touchscreen.
- We started with the assumption that the use of existing domestic appliances for users is confusing, in particular washing machines. Our design process started with the design of two paper prototypes: the first one) is representing an existing
- Washing machine interface (1) represents a common washing machine interface. It has a turning knob to select the type of program and buttons like spinning frequency and/or start button.



- The interface of the washing machine (2) is a touch screen based on icons that represent the various programs. After selecting the program, the details of the washing program would appear by a simple transition.



## 7. Conclusion:

People have “mental models” of how things work, built from different interaction principles. It is responsibility of the designers to first understand the mental model and then try to make a product that will agree to it.



## 8. Viva Questions:

- What is human machine interface?

⇒

⇒ Human Machine Interface:

- A HMI is a user interface or dashboard that connects a person to a machine, system or device
- While the term technically be applied to any screen that allows a user to interact with a device

- What you mean by psychopathology?

⇒

⇒ Psychopathology:-

- Psychopathology is a term which refers to either the study of mental illness or the manifestation of behaviours & experiences which may be in distine of mental illness or psysiological impairments

- What are characteristics of good design?

⇒

⇒ Characteristics of good design:-

- Correctness
- Understandability
- Efficiency
- Maintainability



- Which are different fundamental principles of Interaction?

⇒

⇒ Fundamental principles of Interaction:

- 1 - Discoverability
- 2 - Affordance
- 3 - Signifiers
- 4 - Mappings
- 5 - Feedback
- 6 - Conceptual Models
- 7 - Constraints

- What is conceptual model and mental model

⇒

⇒ Mental model → A mental model refers to a users underlying expectations about how something should work.

Conceptual model → A conceptual model is created by the designer as a high level plan for how the product will work & fit together.

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