Team Members

- Farhana Nishat Esha
  ID : 12211057

- Md. Tanvir Hossain Khondoker
  ID : 12211079

- Pronome Das Turna
  ID : 12211133

- Adiba Ahsan Adrita
  ID : 12211135

Supervised By

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Table of Content

Introduction :

Enter the amazing world of the Interactive Q&A Robot Project! Picture this: a world where robots, coding, and chatting come together for an awesome adventure! Imagine a cute robot buddy with a head and hand that can move around, just waiting to chat with you. Ask it anything, and guess what? It's smart enough to give you really cool answers—it's like having a super-smart friend by your side! But here's the best part: this project isn't just about having fun (though it's super fun!). It's also a fantastic way to learn new things. You'll get to explore special codes that make your robot do all sorts of amazing tricks. Plus, you'll even get to dive into something super exciting called artificial intelligence. It's like teaching robots to understand and talk to us humans! So, if you're ready for an adventure packed with learning and fun, then buckle up! We're going to use some really awesome technology called Arduino to make our interactive robots come to life. Welcome to the Interactive Q&A Robot project—where learning is easy and fun, and every question sparks a new discovery.

Process Model :

The incremental process model is a popular approach in software development where the project is divided into small, manageable increments or iterations. Each iteration involves the analysis, design, coding, and testing phases, with each iteration building upon the previous one. Let's break down how this model applies to the Interactive Q&A Robot project:

1. Analysis Phase :

- **Identify project goals and requirements :** Understand the objectives of creating an interactive robot powered by Arduino.
- **Gather user requirements :** Determine what features and capabilities the robot should have, such as the ability to answer questions, move its head and hand, and engage in conversation.
- **Define the scope of each iteration :** Decide which features will be implemented in each iteration based on priority and complexity.

2. Design Phase :

- **Architectural design :** Plan the overall structure of the robot's software and hardware components, including how it will interact with Arduino.
- **Detailed design :** Design the specific modules and functionalities needed for each iteration, such as the logic for processing questions, controlling movements, and generating responses.

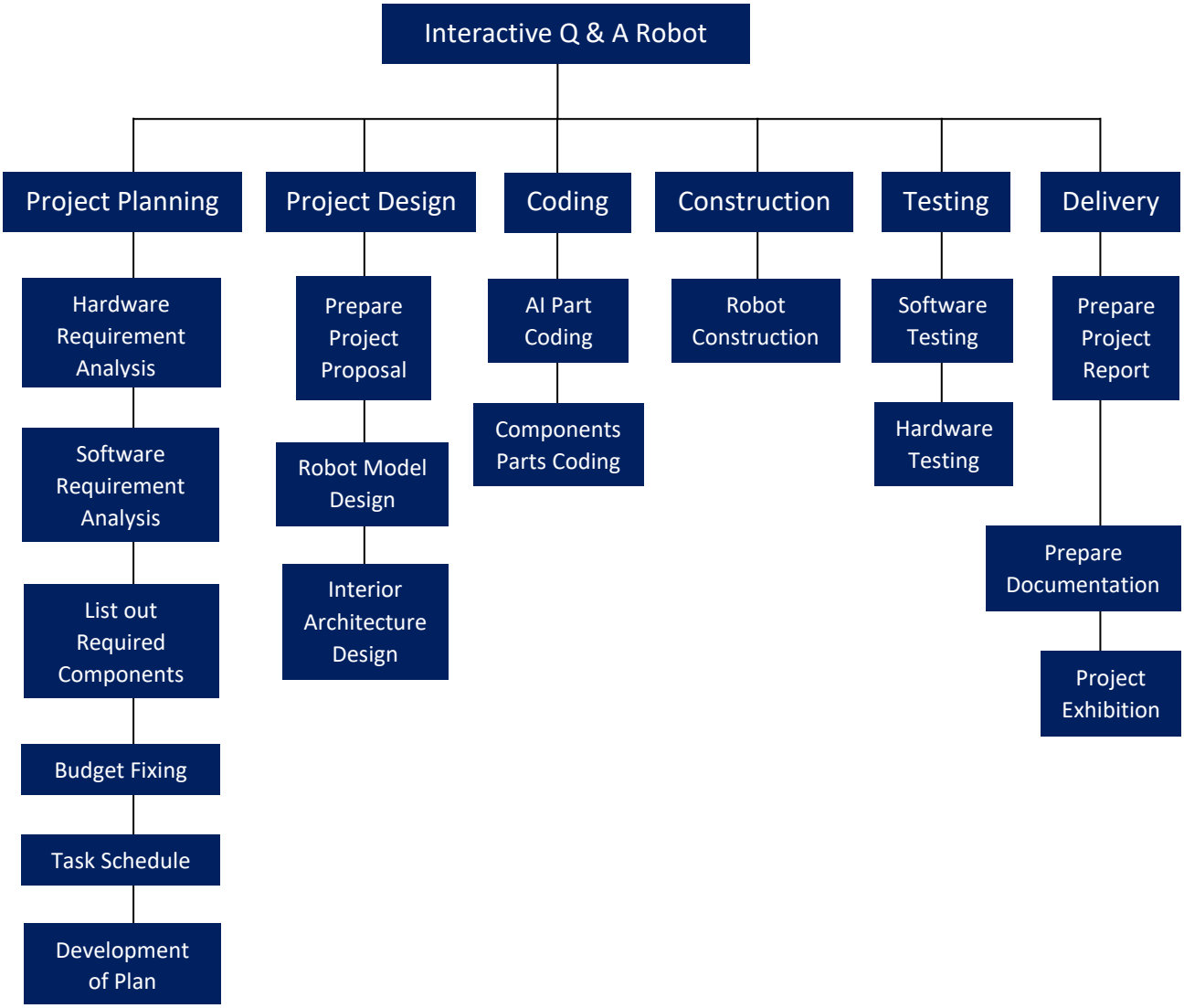
3. Code Phase :

- **Implement features incrementally :** Write code to develop the functionalities outlined in the design phase for the current iteration.
- **Integrate new code with existing functionality :** Ensure that the new code integrates smoothly with previously developed features without causing conflicts or regressions.

4. Test Phase:

- **Unit testing :** Test individual modules or components to verify that they function correctly according to their specifications.
- **Integration testing :** Test the integration of different modules to ensure they work together as intended.
- **System testing :** Test the entire robot system to validate its overall functionality, including its ability to answer questions, move, and engage in conversation.
- **User acceptance testing :** Involve end-users or stakeholders to evaluate the robot's performance and gather feedback for further improvements.

List of Tasks :



Estimation of Each Task :

Estimation of Each Task					
Task Phase	**Task Name**	**Responcible Person**	**ID**	**Duration**	**Total**
Project Planning Phase	Hardware Requirement Analysis	Adiba Ahsan Adrita	12211135	03 Days	12 Days
	Software Requirement Analysis	Md. Tanvir Hossain Khondoker	12211079	04 Days	
	List Out Required Components	Farhana Nishat Esha	12211057	05 Days	
	Budget Fixing				
Project Design Phase	Prepare Project Proposal	Pronome Das Turna	12211133	02 Days	09 Days
	Robot Model Design	Adiba Ahsan Adrita	12211135	07 Days	
	Interior Architecture Design				
Coding Phase	AI Part Coding	Md. Tanvir Hossain Khondoker	12211079	10 Days	10 Days
	Components Part Coding				
Construction Phase	Robot Construction	All	All	06 Days	06 Days
Testing Phase	Testing	Md. Tanvir Hossain Khondoker	12211079	02 Days	02 Days
Delivery Phase	Prepare Project Report	Pronome Das Turna	12211133	03 Days	03 Days
	Prepare Documantation				

Schedule the Task :

Task Schedule				
Time Line	**Task Name**	**Project Part**	**Responsible Person**	**ID**
Week - 01	Requirement Analysis	Software Requirements Analysis	Md. Tanvir Hossain Khondoker	12211079
		Hardware Requirement Analysis	Adiba Ahsan Adrita	12211135
Week - 02, 03	Designing and Procurement	Project Proposal Submission	Pronome Das Turna	12211133
		Robot Model Design	Adiba Ahsan Adrita	12211135
		Components Management	Farhana Nishat Esha	12211057
Week - 04,05	Coding	Coding Part	Md. Tanvir Hossain Khondoker	12211079
Week - 06	Code Testing	Software Testing		
Week - 07	Hardware Assembly	Robot Assembling	All	All
Week - 08	Hardware Testing	Robot Testing	Md. Tanvir Hossain Khondoker	12211079
Week - 14	Project Report & Documentation	Final Report & Documentation Submission	Pronome Das Turna	12211133
Week - 15	Final Review	Final Checking	All	All

Prepare list of milestone:

1. Project Kickoff :

- **Description :** Formal initiation of the project, including team assembly, goal setting, and initial planning.
- **Target Date :** 06.01.2024

2. Requirement Analysis Completed :

- **Description :** Finalization of project requirements, including user stories, use cases, and acceptance criteria.
- **Target Date :** 18.01.2024

3. Design Phase Completed :

- **Description :** Completion of architectural and detailed design for the robot's software and hardware components.
- **Target Date :** 21.02.2024

4. Procurement of Hardware Completed :

- **Description :** Acquisition of all necessary hardware components for robot development and assembly.
- **Target Date :** 28.04.2024

5. Coding Completed :

- **Description :** Initial implementation of core functionalities, such as basic movement control and question processing.
- **Target Date :** 28.04.2024

6. Integration Testing Phase :

- **Description :** Testing the integration of different modules and components to ensure they work together seamlessly.
- **Target Date :** 03.05.2024

7. Final Testing :

- **Description :** Comprehensive testing of the fully integrated robot system, including user acceptance testing with stakeholders.
- **Target Date :** 06.05.2024

8. Assembly Completed :

- **Description :** Physical assembly of the robot, including mounting of hardware components and ensuring proper configuration.
- **Target Date :** 08.05.2024

9. Documentation Finalized :

- **Description :** Completion of project documentation, including design documents, user manuals, and testing reports.
- **Target Date :** 08.05.2024

10. Project Deployment and Launch :

- **Description :** Official deployment of the interactive Q&A robot for use by end-users or stakeholders.
- **Target Date :** 09.05.2024

Staffing Plan :

Name	ID	Role	Responsibility	Duration
Farhana Nishat Esha	12211057	Procurement Specialist	Ordering and managing the delivery of all necessary components for the robot.	06.01.2024 – 02.05.2024
Md. Tanvir Hossain Khondoker	12211079	Lead Software Engineer	Development and testing of the robot's software, including the AI, components movement part	06.01.2024 – 08.05.2024
Pronome Das Turna	12211133	Documentation Specialist	Compilation of all project documentation, including the project proposal, and final report.	06.01.2024 – 08.05.2024
Adiba Ahsan Adrita	12211135	Design and Assembly Engineer	Creation of the robot's design specifications and physical assembly of its components. *Physical assembly Phase done by all team members.	06.01.2024 – 04.05.2024

Monitoring and Control Mechanism :

To tailor the monitoring and controlling mechanisms for our Interactive Q & A Robot Project, consider the following adapted framework :

- **Regular Progress Meetings** :

- Scheduled weekly meetings with our team to evaluate the progress against the project timeline.
- Discussed the completion of tasks assigned to Md. Tanvir Khondoker (coding and testing), Adiba Ahsan Adrita (design), Farhana Nishat Esha (procurement), and Pronome Das Turna (project proposal, report and documentation).

- **Change Management :**

- Created a structured process to handle any requested changes in design, component selection, or project scope.
- Reviewed and approved changes collectively, ensuring they were feasible and beneficial before implementation.

- **Budget and Resource Management :**

- Kept track of the budget as Farhana Nishat Esha ordered components and made adjustments to stay within financial limits.
- Ensured that resources, including team members' time and project materials, are used efficiently.

- **Communication Plan :**

- Developed a plan detailing how updates and changes will be communicated within the team and to any stakeholders, such as university faculty.
- Maintained open lines of communication, especially when coordinating between the coding and assembly phases.

- **Quality Assurance :**

- Implemented a quality control system to check the software developed by Md. Tanvir Hossain Khondoker and the robot assembly completed by Adiba Ahsan Adrita, Pronome Das Turna and Farhana Nishat Esha .
- Regularly inspect the integration of software and hardware to preemptively address any potential issues.

Risk Management :

Objective : To identify, assess, and mitigate risks impacting the project's timeline and deliverables.

Risks can occur :

1. There can be defective components in the required components.
2. Dely in Components delivery can affect on construction of the project.
3. Poor communication among team members can increase the development & construction
4. Not following the project timeline of the project can delay project construction.

Mitigation Plan :

1. Defective Components :

- Implementing a quality assurance process to inspect and test components before they are integrated into the project.
- Maintaining a buffer stock of critical components to replace any defective parts immediately.
- Establishing relationships with multiple suppliers to ensure timely delivery of high-quality components.

2. **Delay in Components Delivery :**

- Maintaining a communication channel with suppliers to track delivery status.
- Prioritizing critical components and order them well in advance.
- Considering alternative suppliers to mitigate delays.

3. **Poor Communication Among Team Members :**

- Developing clear communication protocols within the team.
- Conducting regular meetings to discuss progress, issues, and updates.
- Utilizing collaborative tools for seamless information sharing.

4. **Not Following the Timeline :**

- Creating a detailed project schedule with clear milestones and deadlines.
- Assigning responsibilities explicitly to team members.
- Monitoring progress regularly and address any deviations promptly.

List of Deliverables :

1. **Software Requirement Analysis :** Initial requirements gathered for the software development of the Interactive Q & A Robot project.
2. **Hardware Requirement Analysis :** Detailed analysis of the hardware requirements necessary to build the robot.
3. **Specification and Budget Info :** A comprehensive specification document including budget information for all components and services required.

4. **Project Proposal Submission :** The finalized project proposal that was submitted for approval on 20th of January, 2024.
5. **Robot Model Design :** The preliminary design documents outlining the robot's architecture and functionalities.

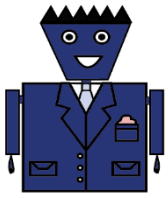


Figure 1: Initial Design

6. **Coding of AI Part :** Instructions for making the robot's answer-giving part using python programming language.
7. **Management of Required Components :** List out all required components, ordering and receiving them for developing the robot.

Components Picture		
Sl no	**Name**	**Photo**
01.	Arduino	
02.	Servomotor	
03.	Speaker	

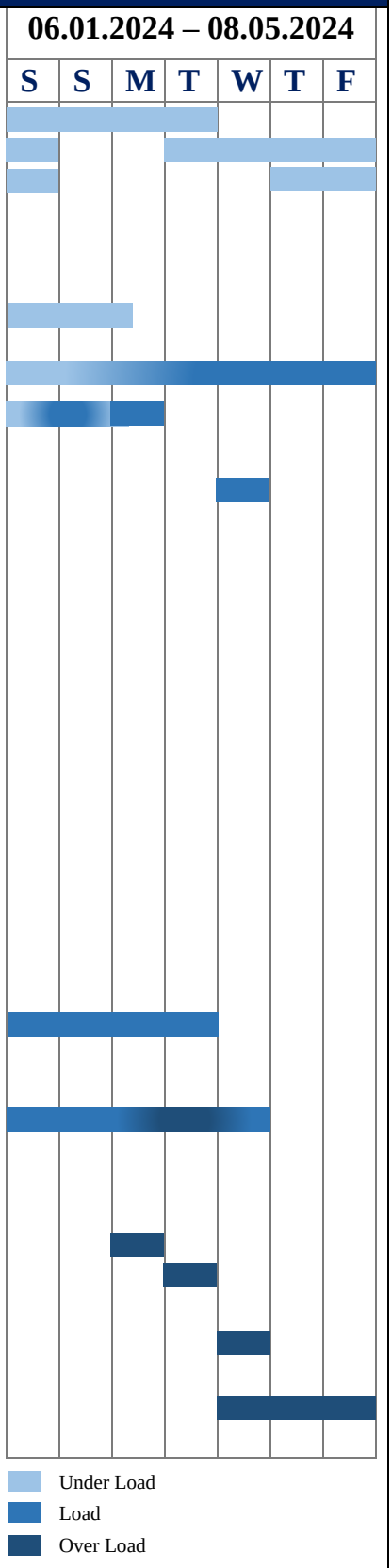
04.	Bluetooth Module	

8. **Coding for Body Part :** Instructions for making the robot's hand and head moving part using Arduino code.
9. **Coding Testing :** It includes both the software and components code testing part.
10. **Robot Assembly :** Assemble all the pieces of the robot body parts and position all required components at their appropriate position.
11. **Final Testing :** Final testing before the project exhibition.
12. **Project Report :** The final report, detailing the development and performance of the Robot that will be formally submitted on the 9th of May, 2024 during the project exhibition.
13. **Project Documentation :** This encompasses a comprehensive overview of the project, detailing its objectives, scope, and the methodologies employed throughout the development process.

Schedule Tracking Process :

Schedule Tracking using Time Line or Gantt Chart

ID	Task Name	Duration	Start	Finish
	Planning Phase :	**17 Days**	**06.01.2024**	**23.01.2024**
12211135	Hardware Requirement Analysis	03 Days	06.01.2024	09.01.2024
12211079	Software Requirement Analysis	04 Days	09.01.2024	13.01.2024
12211057	Components Ordering and Budget Fixing	05 Days	13.01.2024	18.01.2024
12211133	Project Proposal Submission***	02 Days	18.01.2024	20.01.2024
	Task Distribution	01 Day	23.01.2024	23.01.2024
	Designing Phase :	**16 Days**	**05.02.2024**	**21.02.2024**
12211135	Robot Model Design	07 Days	05.02.204	12.02.2024
	Group Meeting	01 Day	14.02.2024	14.02.2024
12211079	Coding for AI Part	06 Days	17.02.2024	23.02.2024
12211057	Received some Components : 1. Arduino Uno 2. HC-02 Bluetooth Module 3. SG90 Survo Motor 4. Glue Gun 5. Glue Stick	01 Day	24.02.2024	24.02.2024
	Project Update***	01 Day	24.02.2024	24.02.2024
12211057	Received Other Components	01 Day	01.03.2024	01.03.2024
	Group Meeting	01 Day	03.03.2024	03.03.2024
12211057	Ordered some new Components New budget added to previous list	02 Day	05.03.2024	07.03.2024
12211057	Received another components : 1. Arduino MicroSD Card Module 2. 3.7V Battery 3. Battery Holder 4. Jumpers	01 Day	12.03.2024	12.03.2024
	Group Meeting	01 Day	16.04.2024	16.04.2024
	Hardware Construction :	**10 Days**	**18.04.2024**	**28.04.2024**
12211057 12211133 12211135	1. Robot Parts Manufacturing 2. Interior Architecture Design 3. Half Assembling	04 Days	18.04.2024	22.04.2024
	Project Update***	01 Day	24.04.2024	24.04.2024
12211079	Coding For Body Parts	04 Days	24.04.2024	28.04.2024
	Group Meeting	01 Day	29.04.2024	29.04.2024
12211057	Orderd for Male Jumpers	01 Day	30.04.2024	30.04.2024
	Received Jumpers	01 Day	02.05.2024	02.05.2024
12211057	Components Testing	01 Day	03.05.2024	03.05.2024
12211079	Assemble Robot	02 Day	04.05.2024	04.05.2024
	Project Update***	01 Day	04.05.2024	04.05.2024
All	**Final Testing**	**01 Day**	**06.05.2024**	**06.05.2024**
	Defect in Robot Movement			
12211133	Project Report and Documentation	03 Days	06.05.2024	08.05.2024
	Last Project Update***	01 Day	08.05.2024	08.05.2024



Defect Tracking Process :

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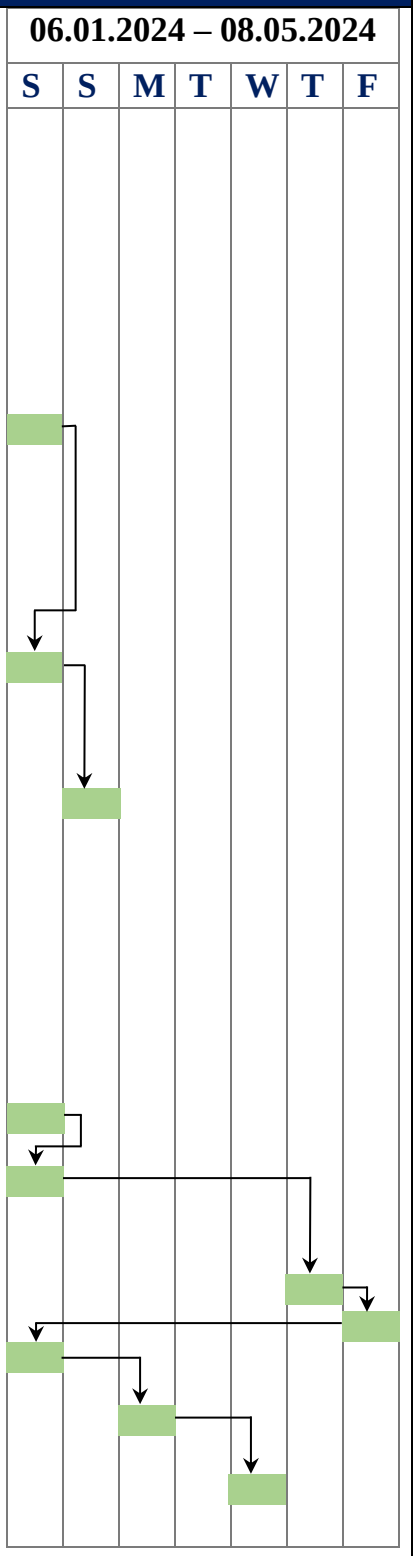

Conclusion :

The Interactive Q&A Robot Project represents a captivating journey of exploration, innovation, and learning. Throughout the course of this project, we have delved into the realms of robotics, electronics, coding, and artificial intelligence, culminating in the creation of a delightful interactive companion capable of engaging in meaningful conversations and providing insightful responses. As we reflect on our achievements, it becomes evident that this project has not only fostered technical skills but also nurtured creativity, problem-solving abilities, and a deeper understanding of emerging technologies. Through hands-on experimentation and collaboration, participants have gained invaluable insights into the intricate interplay between humans and machines, laying the groundwork for future endeavors in the fields of STEM and beyond. Furthermore, the Interactive Q&A Robot Project has served as a testament to the power of interdisciplinary collaboration and experiential learning. By bridging the gap between theory and practice, this project has empowered participants to become active agents of their own learning journey, sparking curiosity, fostering innovation, and inspiring a passion for lifelong learning. As we bid farewell to this chapter of our journey, let us carry forward the lessons learned and the experiences gained, embracing the spirit of exploration and discovery in all our future endeavors. Whether in the classroom, the laboratory, or the world at large, may the knowledge and insights gained from the Interactive Q&A Robot Project continue to illuminate our path forward, shaping a brighter and more promising future for all.

Final Project :