REPUBLIQUE ALGERIENNE DEMOCRATIQUE ET POPULAIRE
الجمهورية الجزائرية الديمقراطية الشعبية

MINISTERE DE L'ENSEIGNEMENT SUPERIEUR
ET DE LA RECHERCHE SCIENTIFIQUE

ECOLE SUPÉRIEURE EN SCIENCES APPLIQUÉES
–T L E M C E N–

وزارة التعليم العالي والبحث العلمي

المدرسة العليا في العلوم التطبيقية
–تلمسان–

HIGHER SCHOOL IN APPLIED SCIENCES–T L E M C E N–

Electronics and Industrial software engineering

Project management

JARVIS-Inspired Smart Home for disabled people

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UNIVERSITY YEAR : 2024-2025

Introduction

This section outlines the planning and execution strategy for the development of the JARVIS-Inspired Smart Home for Disabled People. It includes key objectives, project scope, stakeholder roles, deliverables, and the approach to manage tasks and timelines.

Project Overview

The project aims to develop an AI-powered smart home system to enhance the daily life of individuals with disabilities by providing automated, voice-controlled assistance and safe mobility within the household environment.

Project Team and Roles

The team consists of engineers, developers, and specialists, each responsible for a specific domain. Embedded developers handle hardware integration, AI engineers focus on computer vision and voice processing, while mobile developers are tasked with UI/UX and app integration. The electronics team oversees physical implementation, and the cloud engineer ensures backend communication and data storage.

Key Outcomes and Deadlines

The project is broken into major phases:

- Requirements analysis and initial design
- Prototyping and AI integration
- Hardware and software development
- Testing and user feedback incorporation
- Final deployment and documentation

Each phase has associated deadlines to ensure timely delivery of a working prototype and final product.

Scope of the Project

The project scope includes:

- Must-have features: AI voice assistant, wheelchair control, obstacle detection, remote monitoring, and environment interaction
- Nice-to-have features: Personalized assistant functions like calendar reminders and weather updates
- Not in scope: Physical object handling by the system, stair climbing, and terrain mobility beyond flat indoor environments

Project Milestones

Key milestones include:

- Finalization of requirements and user needs
- Technology selection and integration planning
- Development and validation of functional prototype
- Security and performance testing
- User training and system handover

Stakeholder Identification

The stakeholders consist of clients (families, institutions), end-users (disabled individuals), and caregivers. Their feedback plays a vital role in system design and validation.

Deliverables

The primary deliverables are:

- A functional smart home system prototype
- A mobile interface for remote interaction
- AI-based wheelchair and assistant software
- Technical documentation and user manual

Action Plan and Task Management

Tasks are broken down by specialty and estimated durations. Team members are assigned roles based on expertise. Responsibilities include model training, circuit design, frontend/backend development, and field testing.

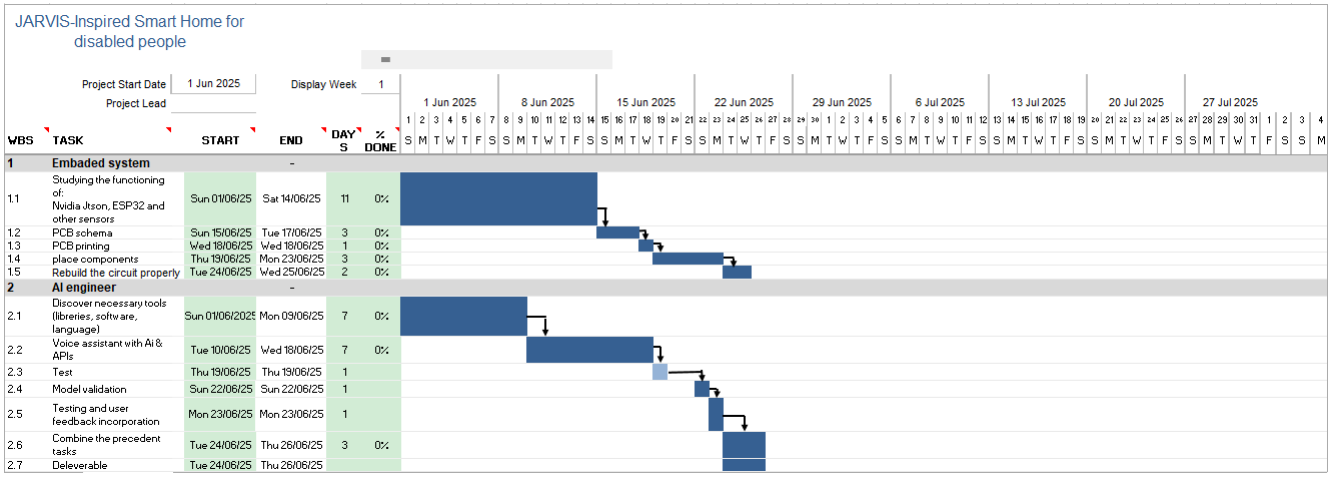
Development of the project with Agile method

Choosing the agile method to develop a smart home adapted to people with reduced independence is a strategic and human decision.The reasons are as follows:

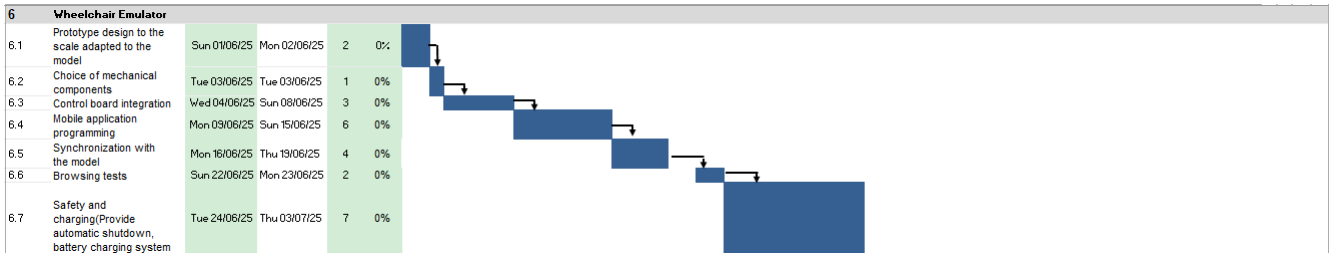
- People with reduced independence have very specific and often changing needs (depending on their health, environment, or autonomy). The agile method allows for rapid project adjustments through short sprints and frequent feedback loops.
- In an agile project, users are regularly involved. This allows us to obtain concrete feedback to create a home that is truly adapted to their real needs, not to assumptions.

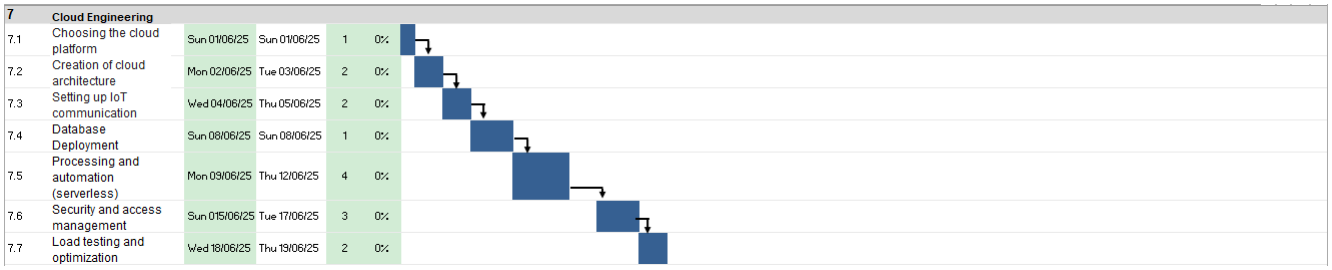
- The smart home industry is constantly evolving. The agile method allows you to stay up to date, easily integrate new features, and continuously improve your living environment.

Gantt table



WBS	TASK	START	END	DAYS	% DONE
1	**Embaded system**		-		
1.1	Studying the functioning of: Nvidia Jtson, ESP32 and other sensors	Sun 01/06/25	Sat 14/06/25	11	0%
1.2	PCB schema	Sun 15/06/25	Tue 17/06/25	3	0%
1.3	PCB printing	Wed 18/06/25	Wed 18/06/25	1	0%
1.4	place components	Thu 19/06/25	Mon 23/06/25	3	0%
1.5	Rebuild the circuit properly	Tue 24/06/25	Wed 25/06/25	2	0%
2	**AI engineer**		-		
2.1	Discover necessary tools (libreries, software, language)	Sun 01/06/2025	Mon 09/06/25	7	0%
2.2	Voice assistant with Ai & APIs	Tue 10/06/25	Wed 18/06/25	7	0%
2.3	Test	Thu 19/06/25	Thu 19/06/25	1	
2.4	Model validation	Sun 22/06/25	Sun 22/06/25	1	
2.5	Testing and user feedback incorporation	Mon 23/06/25	Mon 23/06/25	1	
2.6	Combine the precedent tasks	Tue 24/06/25	Thu 26/06/25	3	0%
2.7	Deleverable	Tue 24/06/25	Thu 26/06/25		
3	**App developing**		-		
3.1	Studying FLUTTER	Sun 01/06/25	Mon 02/06/25	2	0%
3.2	Developing the backend	Tue 03/06/25	Mon 16/06/25	10	0%
3.3	Link the backend with MQTT/WebRTC	Tue 17/06/25	Thu 19/06/25	3	0%
3.4	Creat the UI/UX designe	Sun 22/06/25	Thu 10/07/25	15	0%
3.5	Testing and user feedback incorporation	Sun 13/07/25	Sun 13/07/25	1	
3.6	Developing the frontend	Mon 14/07/25	Fri 01/08/25	15	0%
3.7	Deliverable	Sat 02/08/25	Sat 02/08/25	1	
4	**Electronic engineer**		-		
4.1	Place motors, relays, batterie	Sun 01/06/25	Tue 03/06/25	3	0%
4.2	Testing and user feedback incorporation	Wed 04/06/25	Wed 04/06/25	1	
4.3	Creat the braking circuit schema	Thu 05/06/25	Sun 08/06/25	2	0%
4.4	Braking PCB printing	Mon 09/06/25	Mon 09/06/25	1	0%
4.5	Place components	Tue 9/6/2025	Tue 9/6/2025	3	0%
4.6	Testing and user feedback incorporation	Wed 11/06/25	Wed 11/06/25	1	
4.7	Rebuild the circuit properly	Thu 12/06/25	Sun 15/06/25	2	0%
5	**Model realization team**				
5.1	Design of the model plans	Sun 01/06/25	Mon 02/06/25	2	0%
5.2	3D modeling or manual sketching	Tue 03/06/25	Thu 05/06/25	3	0%
5.3	Choice of materials for the model	Sun 08/06/25	Wed 11/06/25	1	0%
5.4	Cutting and assembly	Mon 09/06/25	Sun 08/06/25	3	0%
5.5	Installation of home automation modules	Tue 12/06/25	Mon 16/06/25	4	0%
5.6	Preparation of the main code	Tue 17/06/25	Wed 25/06/25	7	0%
5.7	Test and debugging	Wed 25/06/25	Thu 26/06/25	2	0%





Pert graph

N° Tasks	Name of task	Duration (by week)	predecessor	Successor
A	Need analysis of users	2-3	-	B,C,E
B	Smart home simulation	1-2	A	D
C	interconnection of the necessary hardware resources (actuators, sensors, Microcontroller)	3-7	A	D
D	Developement of code	4-5	C,B	F
E	Development of mobile application	9-11	-	G
F	integrate the cloud space	4-4	D	G
G	build the model of smart home	4-5	F,E	H
H	realize the wheelchair emulator	5-7	G	I
I	create a project user guide	3-4	H	-

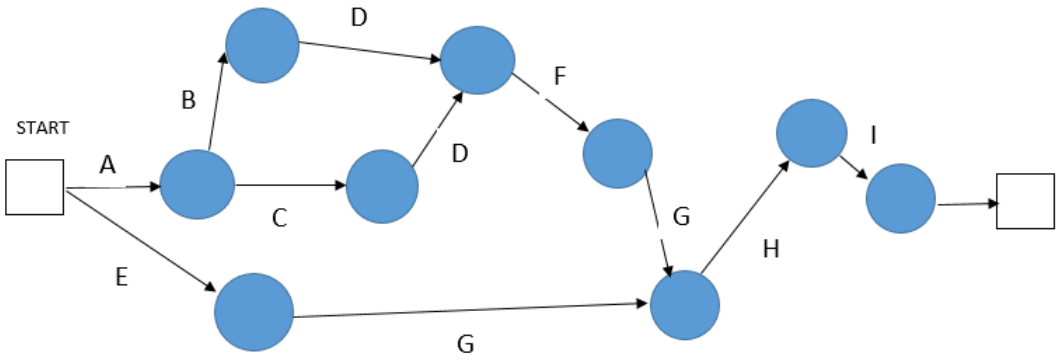


Figure 1: ert graph

- Earliest Event Dates and Earliest Start Dates

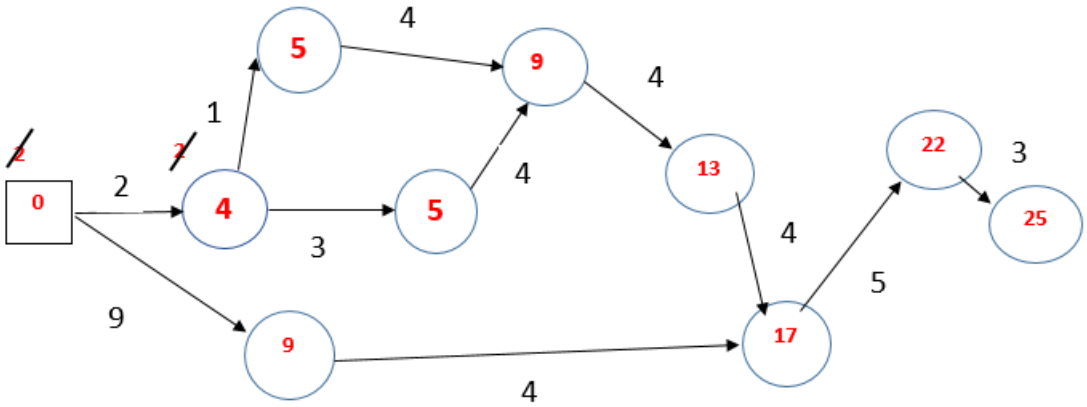


Figure 2: pert graph:Earliest Event Dates

- Latest Event Dates and Latest Start Dates

- Critical path:(critical path figure) Events on the crical path have the earliest event date equal to the latest event date.

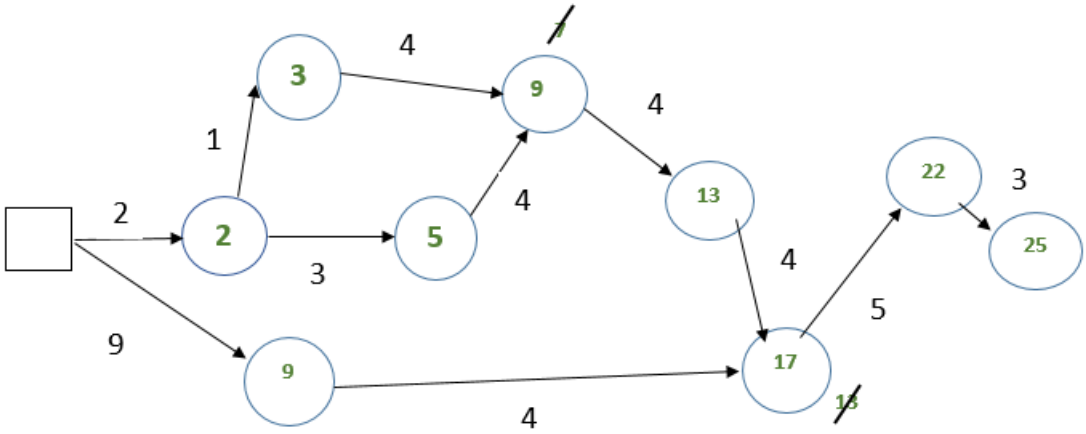


Figure 3: pert graph,Latest Event Dates

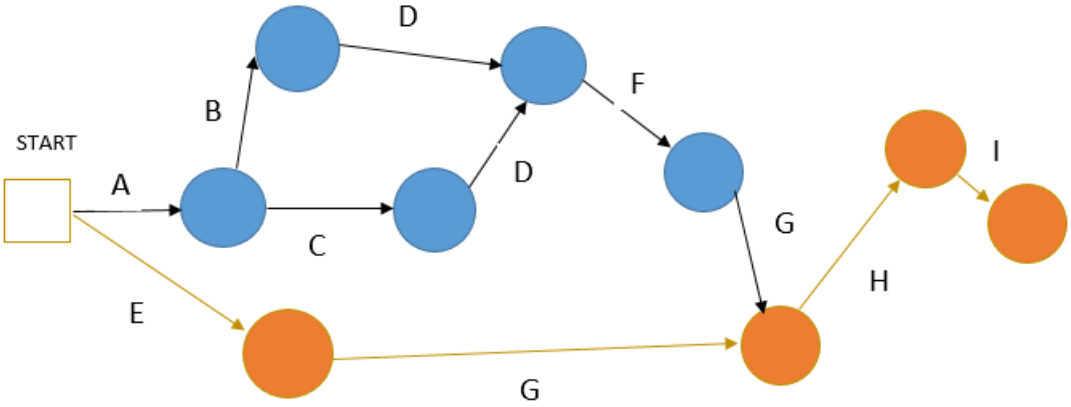


Figure 4: pert graph,critical path

Review and Feedback

Regular reviews are conducted to align with project goals. Feedback from stakeholders is incorporated throughout the process to refine system usability and performance.

Expected Challenges

Potential issue	**Probable cause**	**Considered solution**
Delay in PCB manufacturing	Supplier delay	Order ahead
Short circuit on board	Poor design or soldering	continuity tests before use
Very heavy AI model	Problem of computing equipment	look for a lab equipped with a powerful material
problem of sensors used	incorrect pinout, does not work	Read datasheet, change it
Internet connection		
communication problem	misuse of equipment, connection problems	
Real time problems	computing equipment, materials	Change material
the 3d parts are broken		

Table 1: Main risks identified and solutions considered

Conclusion

A structured and agile planning process supports the successful execution of the smart home project. Iterative development, milestone tracking, and user-centric design are essential to achieving impactful and accessible results.