TWO WHEELED BALANCING ROBOT AS AN EMBEDDED SYSTEM

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1. Problem description:

Two – wheeled self balancing robot is designed using the concepts of Circuit design and simulation. It is automatic that carries a payload from source location to the destination according to user commands. Tool chain Simulide is being used to design and develop the model. The project will be tested for various test cases in the domain specific software's in order to validate and verify the model with respect to client's requirements.

This project enabled me to understand the concept and the approach of embedded system design in detail. It also enabled me to apply the concept of embedded system design and development in this project.

2. Requirements:

Requirement design and analyzes of customer needs

2.1 High level requirements:

Test ID	Description	Category	Status
HLR_01	The robot shall expected to transport a payload from one Location to another.	Functional	To be implemented
HLR_02	The robot shall expected to balance itself and also the payload while working.	Functional	To be implemented
HLR_03	The robot shall balance itself from sudden obstacle.	Functional	To be implemented
HLR_04	The robot shall expected to calculate the torque required	Functional	To be implemented

HLR_05	The robot shall be expected to calculate the torque and speed required to balance itself.	Technical	To be implemented

2.2 Low level requirements:

Test ID	Description	HLR_ id	Status
LLR_ 01	The robot shall be receiving the source and destination location from user	HLR_ 01	To be implement ed
LLR_ O2	The robot shall be employing its wheels connected to DC motor to achieve its goal	HLR_ 01	To be implement ed
LLR_ 03	The robot shall be carrying load on it throughout the entire process	HLR_ 01	To be implement ed

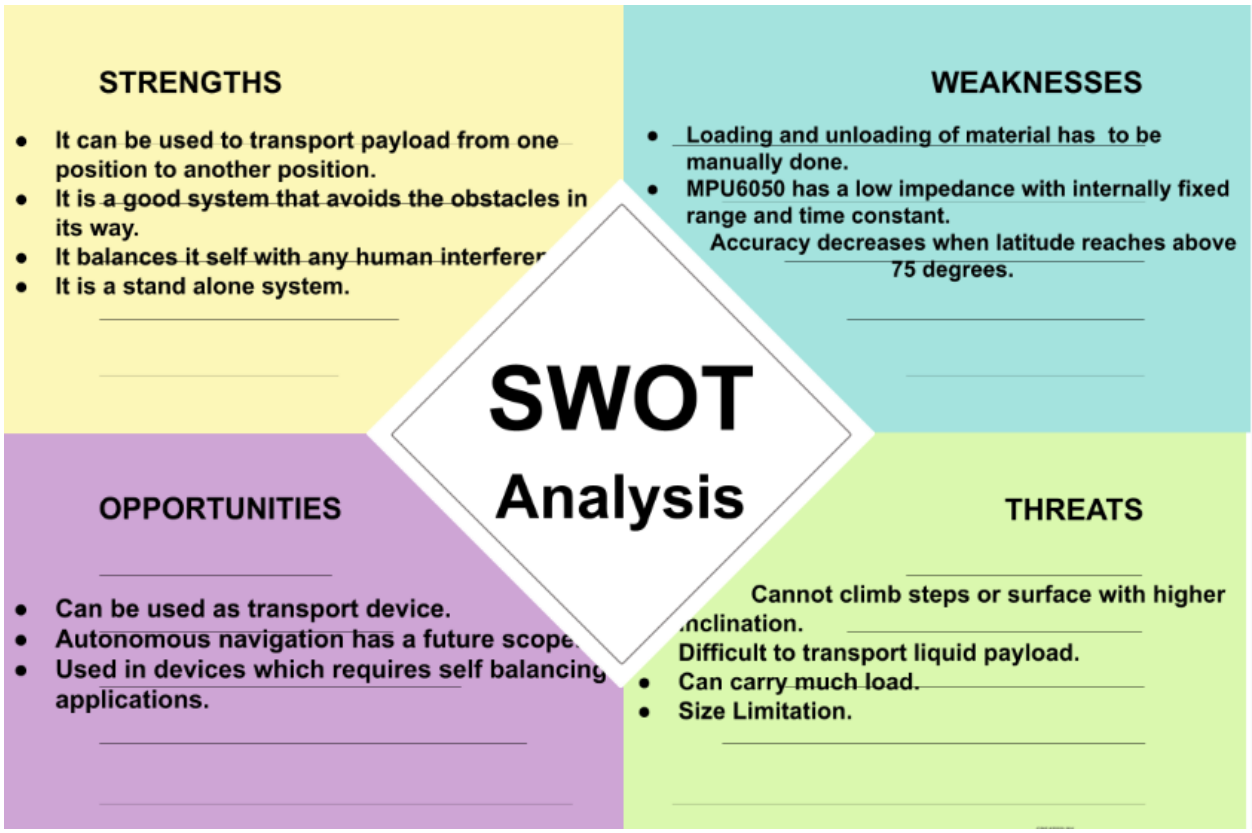
LLR_04	The robot shall be incorporated with sensors like accelerometer and gyroscope or combination of both in order to achieve the high level requirement 2	HLR_02	To be implemented
LLR_05	The robot shall be employing the perceived sensory information balance itself and payload	HLR_02	To be implemented
LLR_06	The robot shall be able to sense the loci of itself and act upon the sudden obstacle found in its way avoid it by acting on sensory input	HLR_03	To be implemented
LLR_07	The robot shall be able to process the sensory input and calculate the required torque to balance itself and to move in its way	HLR_04	To be implemented
LLR_08	The robot shall be able to decide the speed required for the motion based on the torque calculated	HLR_5	To be implemented

3. Components used:

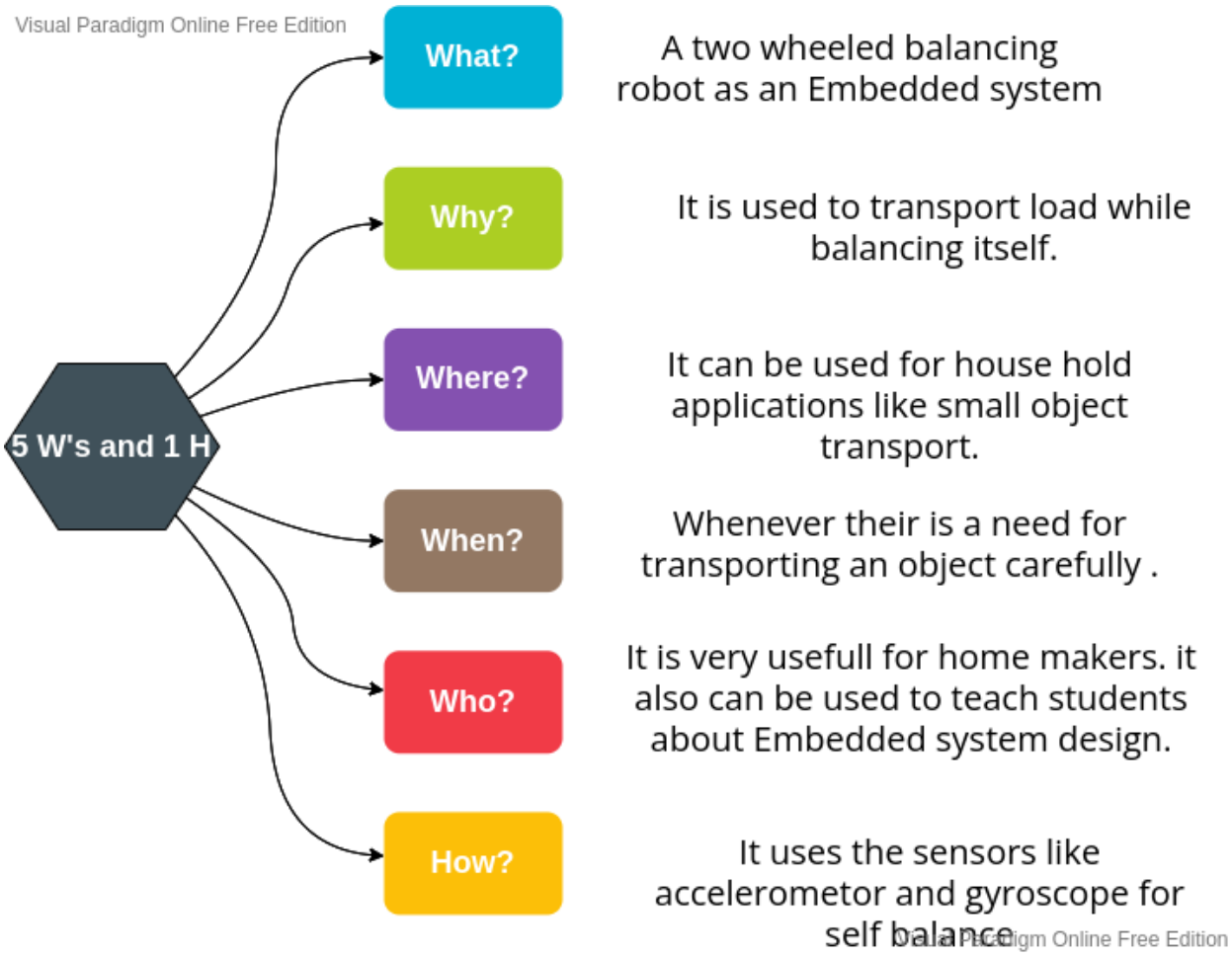
S L No	Component	Description
1.	Arduino Uno	Arduino Uno is a microcontroller board based on the ATmega328P family. It has digital input/output pins (of which 6 can b used as a PWM outputs), 6 analog input pins, a 16 MHz ceramic resonator, an US connection, power jack, an ICSP header a reset button.
2.	MPU 6050	The MPU6050 consists of a 3-axis Accelerometer and 3-axis Gyroscope. Which measure acceleration, velocity, orientation, displacement and many other parameters
3.	DC Motors	It uses a stationary set of magnets in the stator, and a coil of wire with a current running through it in order to generate an electromagnetic field which is aligned with the center of the coil.
4.	L293D Driver	The L293D is a 16-Pin Motor Driver IC. it is mainly used to drive the motors. A single L293D IC which is capable of

		running two DC motors at once and also the direction of these two motors can be controlled
5.	16x2 LCD	The term LCD stands for liquid crystal display. It is one kind of electronic display module used in an extensive range of applications like various circuits & devices like mobile phones, calculators, computers, TV sets, etc. These displays are mainly preferred for multi-segment light-emitting diodes and seven segments. The main benefits of using this module are inexpensive.
6.	10 Ohm Potentiometer	a single turn 10k Potentiometer has a rotating knob.. These three-terminal devices can be used to vary the resistance between 0 to 10k ohms by simply rotating the knob.

4. SWOT Analysis:



5. 5 W’s and 1 H:


Visual Paradigm Online Free Edition
5 W's and 1 H
What?
A two wheeled balancing robot as an Embedded system
Why?
It is used to transport load while balancing itself.
Where?
It can be used for house hold applications like small object transport.
When?
Whenever their is a need for transporting an object carefully .
Who?
It is very usefull for home makers. it also can be used to teach students about Embedded system design.
How?
It uses the sensors like accelerometor and gyroscope for self balance.
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6. Applications:

Two wheeled balancing robots use a “closed-loop feedback control” system. Which means that real-time data from motion sensors is used to control the motors and quickly compensate for any tilting or imbalance in motion in order to keep the robot upright. Similar self-balancing feedback control systems can be seen in many other applications in day to day life. Some of the examples include:

- Segways
- bipedal robots
- space rockets

etc.