Guru Gobind Singh College of Engineering and Research Centre, Nashik.

Department of Computer Engineering

Project Synopsys

Academic Year: **2023-24**

Project Title	Mind Driven Tank : The Future of warfare
Team Members	1. Tejal Landge
	2. Shubhangi Kekane
	3. Akash Jadhav
	4. Sudhanshu Ghuge
Internal Guide (Name and Sign)	Prof. P. K. Bachhav
Project Coordinator (Name and Sign)	Prof. P. K. Bachhav

Guru Gobind Singh College of Engineering and Research Centre, Nashik
Department of Computer Engineering
Academic Year 2023-24
Final Year Project Synopsys Format

Title of the Project: Mind Driven Tank : The Future of Warfare.

Objective and Scope: The objective of a Mind Driven Tank is to enhance the efficiency, effectiveness, and precision of military operations by harnessing the power of the human mind and advanced AI technologies. It aims to create a symbiotic relationship between human operators and machines, allowing for more intuitive control and decision-making in combat scenarios.

1. To understand the concept and potential applications of mind-driven tanks in military operations.
2. To explore the challenges and ethical implications of using mind-controlled technology in warfare.
3. To investigate the feasibility of developing mind-driven tanks and their integration with existing military infrastructure.

Process Description:

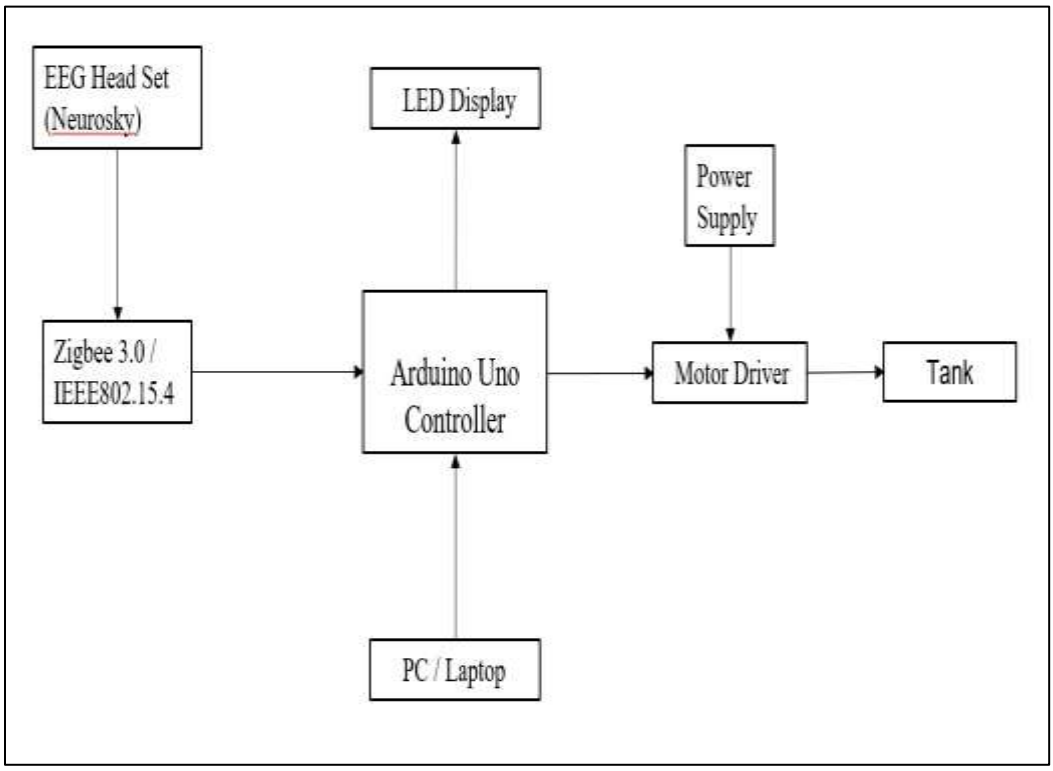

Fig :- Block diagram

Brief Description :

The proposed invention seeks to simplify the problems of military by integrating brain-computer interface(BCI) technology with tanks:

The flow of system is as follows:

a. Brain-Computer interface(BCI):we are using the BCI technology by using the Neurosky mindwave device and used EEG-Headset, which measures the electrical activity in the brain and then translates them into meaningful commands to tank. Here directly we are interfacing the military person brain with the tank to produce desired outputs , where the person needs to wear the EEG headset on the forehead.

Fig :- person wearing neurosky headset

b. Signal Processing and Interpretation: The raw brainwave data collected using the neurosky device is processed through certain algorithms like "attention" and "eye-blink". This aglorithms helps to specify mental states or commands from the operator.We can observe the frequency of algorithms on the android developer tool 2.0(only used for neurosky device), by observing the frequencies, we can decide the range of the algorithms. According to the level of attention and eye-blink the tank will be operated to move in certain directions.

Fig :- Frequency Analysis (Android Developer Tool 2.0)

For connectivity we are using zigbee 3.0 which is wirelessly connected with the neurosky mindwave. As the zigbee carries wide range of advantages, such as reducing the concern of bluetooth range we are using it to connect with neurosky mindwave. Therefore zigbee acts as a interface between the neurosky mindwave and arduino uno.

c. Signal Conversion Into Commands : when the signals are sent to the arduino uno via Zigbee communication. we provide a Code to the arduino uno in which there are conditions for the algorithms such as attention and eye blink detection.

for example i.e the condition can be given as : if (attention > 40 && attention < 60) forward(); as per the given conditon we understand that tank will move forward. similarly, we can add the conditions for backward ,left ,right and rotate movements. Hence, we understand that by Using the algorithms and methodology the signals are converted into commmands and these commands are sent to motor-driver to drive the tank.

d. Tank Automation: The tank is equipped with advanced automation that interprets the commands received from the neurosky mindwave and execute the corresponding actions such as movement of turn left, turn right, forward, backward, rotate and stop.

e. Operator training: The tank operator must undergo specialized training to develop a strong mental connection with the BCI and learn how to generate specific brainwave patterns to control the tank effectively.Inshort the person who is operating the tank must have a good balanced mental state.

Flowchart :

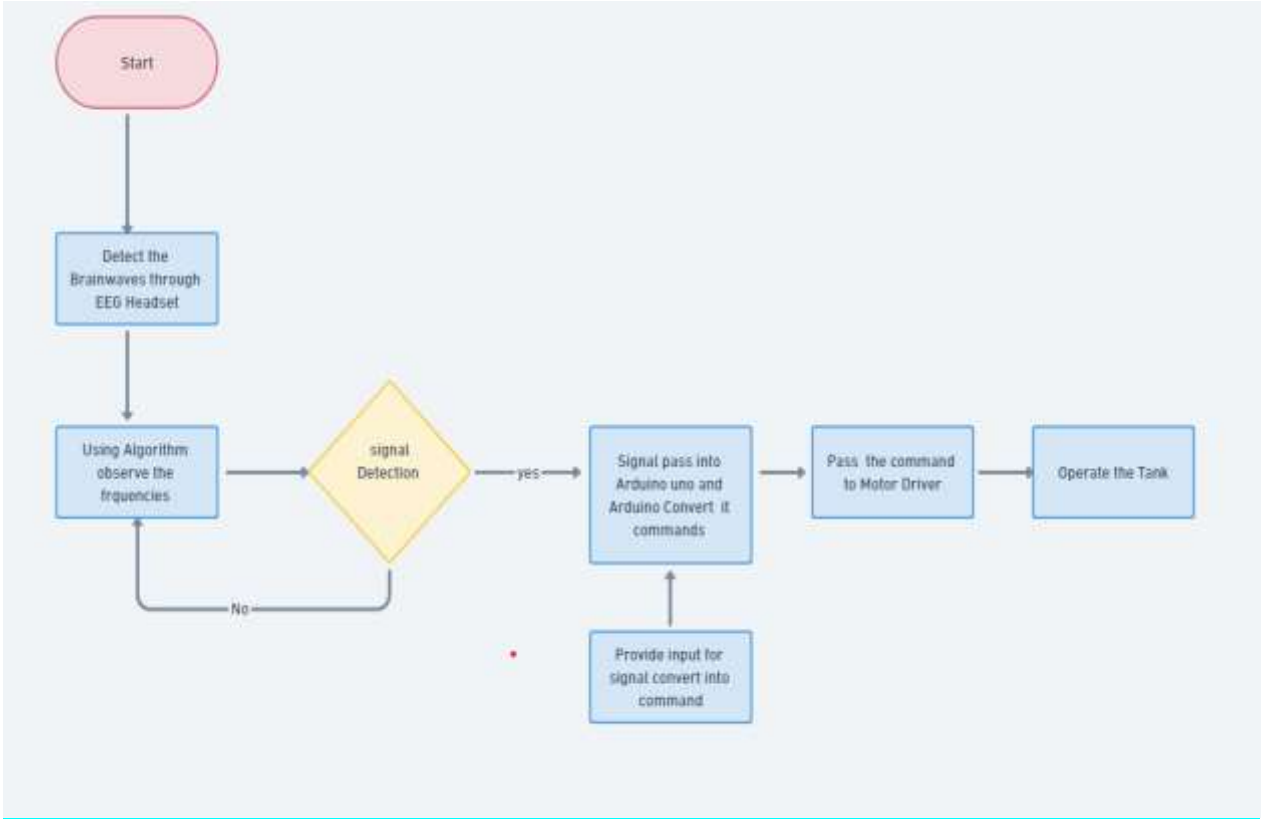

Fig :- Flowchart of our system

Here's a step-by-step flow of how the mind-driven tank system would work:

1. Operator Wears the Brain-Computer Interface (BCI)
2. Initialization and Calibration
3. Zigbee Pairing
4. Operator's Intentions Decoded
5. Brain Signals Transmitted via Zigbee
6. Tank Control System Receives Brain Signals
7. Arduino uno Interprets
8. Commands Executed
9. Tank Performs Actions
10. Feedback and Telemetry

Resources: The requirement of the resources for designing and developing the proposed system are as mentioned below:

- **Hardware Requirement** :

1. Arduino Uno
2. ZigBee 3.0
3. 60 RPM DC Motor
4. DC Power Jack
5. Cables
6. Battery 12V(each) * 3
7. 3D printed base (Wheels of the tank)
8. Neuro Sky device
9. Motor Driver

- **Software Requirement** :

1. Android Developer Tool 4.2 (TG Stream Demo_ Mind Wave Mobile.apk)

References:

1. **Survey on BRAIN CONTROLLED CAR FOR DISABLED USING EEG (RAISA VARGHESE[1] SAIKRISHNA D[2,] NEETHAL EPHARAM, SHAHAS AHAMED Assiatant professor, Dept. of CSE, Sahrdaya College of Engineering and Technology, Kodakara, Kerala, India):**

   This chapter considers the development of EEG-based brain controlled car, which can serve as powerful aids for physically disabled people. Since these cars will rely only on what the individual is thinking they will hence not require any physical movement on the part of the individual. It captures EEG signals from the drivers brain using EEG head set which contain three electrodes. The instruction for the movement is programmed and stored using ARDIUNO and the connection between head set and Arduino is established using Bluetooth. The instruction from the brain is displayed on a screen. The output from the ARDIUNO is connected with driver motor. The project is focused on scope on BCI in the transportation field and also for encouraging disabled people for driving.

2. **Brain Controlled Vehicle (Shreyansh Srivastava, Praveen Yadav, Mahendra Pratap Verma):**

   Physically disabled individuals continually depend on their family members for their everyday movements. There is a ton of research proceeding to help these individuals control their movements using brain signals. For acquiring the brain signals we utilize a method called as electroencephalogram (EEG), which deals with the electric signals produced in the mind, by extricating these pulses we can follow the condition of the psyche, for instance meditation, attention. An electroencephalogram (EEG) provides us with various frequencies which can be additionally decoded as the state of mind. For the general population with inabilities, it very well may be utilized to control a vehicle or it very well may be executed for anything which should be dealt with for movement through wheels

3. **Conversion of EEG Activity Into Cursor Movement by a Brain Computer Interface (George E.FabianI, Dennis J. McFarland, Jonathan R. Wolpaw , and Gert Pfurtscheller , Member , IEEE):**

   The BCI uses amplitude in mu or beta frequency bands over sensorimotor cortex to control cursor movement. Trained users can move the cursor in one or two dimensions. The primary goal of this research is to provide a new communication ans control option for people with server motor disabilities. This study used offline analysis of data collected during the system operation to explore methods for improving the accuracy of cursor movement.

4. **Brain Controlled Robot Cars (R.S. Shekhawat1[a], Rajat Sharma2[b] and Ravi Rao2 Assiatant Professor Department of Electrical Engineering, B. K. Birla Institute of Engineering & Technology, Pilani, India):**

   Robot Car is that device that can be remotely controlled using the user's brain signals. This system uses BCI (Brain-Computer Interface) to provide communication between our brain and the robotic car. It uses an EEG (Electroencephalogram) headset to acquire data, classifies and interprets the data set on the hardware, and achieves desired commands on the robotic car based on the provided classification. The data is transferred through a Bluetooth module, while the commands are executed by Arduino.

5. **Design and Implementation of Low Cost Intelligent Wheelchair (Mohammed Faeik Ruzaij , S.Poonguzhali Center for Medical Electronics, Department of Electronics and Communication Engineering, College of Engineering Guindy, Anna University, Chennai-600025, India abnalfratain@yahoo.com, poongs@annauniv.edu) :**

   The wide spread prevalence of lost limbs and sensing system is of major concern in present day due to wars, accident, age and health problems. An intelligent wheelchair is developed to help these type of patients by using speech recognition system to control the movement of wheelchair in different directions by using voice commands and also the simple movement of the patient's fingers with keypad control. Automatic obstacle detection is done using an ultrasound system which helps the patient to apply a temporary brake in case any obstacle suddenly comes in the way of the wheelchair. The intelligent wheelchair is designed in such a way that it can be controlled easily with minimum effort from the patient and also provides protection from obstacle collision if any voice mistake happens. The main advantage is the low cost design which allows more number of patients to use this type of wheelchair.

why should the department approve our project :

- Firstly, this innovative project represents a significant leap in military technology, aligning with the department's mission to stay at the forefront of defence capabilities. By integrating Bluetooth HC-05 and EEG sensors with an Arduino-controlled tank, we harness cutting-edge advancements in neuroscience and robotics, potentially revolutionizing warfare strategies.

- Secondly, this project enhances soldier safety by reducing human exposure to combat zones. A mind-driven tank can be remotely operated, minimizing the risk to human operators. It can navigate challenging terrains and execute complex maneuvers with precision, reducing casualties and collateral damage.

- Moreover, the project promotes cost-efficiency in the long run, as it could lower the need for expensive manned tank crews. It can also extend the tank's operational lifespan, as it's not subject to human fatigue or limitations.

- Lastly, the "Mind-Driven Tank" has dual-use potential, enabling its application in humanitarian missions and disaster relief efforts. Its versatility aligns with the department's commitment to addressing both military and humanitarian needs.

- In conclusion, this project offers groundbreaking advancements in military technology, enhances safety, reduces costs, and exhibits versatility, making it a compelling endevor for department approval.

Strengths and Limitations of your proposed work :

The concept of a "Mind-Driven Tank" represents a futuristic and potentially groundbreaking innovation in warfare. However, like any advanced technology, it comes with both strengths and limitations:

- **Strengths :**

1. **Enhanced Maneuverability** : A mind-driven tank could be more agile and responsive than traditional tanks. It can quickly adapt to changing battlefield conditions and navigate complex terrain, offering a tactical advantage.

2. **Reduced Risk to Human Operators** : By removing human operators from the tank, the risk to soldiers' lives in combat situations is significantly reduced. This technology can potentially save lives on the battlefield.

3. **Improved Reaction Time** : With advanced AI and neural interfaces, a mind-driven tank could react to threats faster than a human operator, increasing its ability to defend against enemy attacks.

4. **Precision Targeting** : The system's accuracy and precision could lead to more targeted and efficient use of weapons, reducing collateral damage and civilian casualties.

5. **Psychological Deterrence** : The existence of such advanced military technology can act as a deterrent, discouraging potential adversaries from engaging in conflicts due to the perceived overwhelming capabilities.

- **Limitations :**

1. **Ethical Concerns** : The development and deployment of autonomous military machines raise ethical questions about the potential for misuse and the inability to hold responsible parties accountable in case of unintended harm.

2. **Cybersecurity Risks** : A mind-driven tank would be vulnerable to cyberattacks, potentially allowing adversaries to gain control over the system, leading to security breaches or even friendly fire incidents.

3. **High Development Costs** : Developing and maintaining such advanced technology is expensive. It may divert resources from other critical military and societal needs.

4. **Limited Versatility** : Mind-driven tanks may excel in specific scenarios but could be less versatile than human-operated vehicles in situations that require complex decision-making and adaptability beyond their programming.

5. **Dependency on Technology** : Relying on advanced technology can create vulnerabilities, as military forces become dependent on systems that could be disrupted by electronic warfare, EMP attacks, or other means.

positive impact of the project on society/academics/college/industry :

The "Mind-Driven Tank: The Future of Warfare" project has the potential to yield significant positive impacts across society, academia, colleges, and the industry :

1. **Societal Impact**: This project could contribute to global security by offering a safer and more efficient means of conducting military operations. Fewer human lives would be at risk in combat, aligning with society's increasing emphasis on minimizing conflict-related casualties. Additionally, the technology developed could have applications in disaster response, aiding in humanitarian efforts and saving lives during crises.

2. **Academic Advancement**: The project involves cutting-edge interdisciplinary research in neuroscience, robotics, and military technology. It can stimulate academic exploration, leading to a deeper understanding of the brain-machine interface, which could have broader applications in fields such as healthcare, assistive technology, and cognitive science.

3. **College Programs**: Colleges can benefit by offering specialized courses or research programs related to this technology. It could attract students and researchers interested in emerging fields, boosting enrolment and fostering collaboration with industry partners.

4. **Industrial Advancement**: The project could drive innovation in the defence industry, spurring the development of more advanced robotic systems and applications. This could lead to commercial spin-offs, creating new job opportunities and economic growth.