CSE360 Project

Project Title:

CanSat - Exploring Atmospheric Conditions

Group 4
Members:

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Introduction:

Embarking on the CanSat project signifies our group's collective enthusiasm to move beyond theoretical knowledge and immerse ourselves in the practical intricacies of satellite design. The prospect of constructing a CanSat, a miniature satellite, is not just an educational endeavor but a unique opportunity to experience the complexities of satellite technology firsthand. This project serves as a bridge between theoretical concepts and real-world applications, offering a hands-on approach to learning.

Exploring the Motivation:

Our decision to undertake the CanSat project goes beyond mere academic curiosity. It's driven by a collective ambition to break free from traditional learning boundaries. We actively sought a project that would provide us with a tangible understanding of satellite functionalities, allowing us to witness the direct application of our knowledge. The motivation stems from a desire for a more immersive and impactful educational experience.

Educational Objectives:

The CanSat project serves as an educational vehicle with multifaceted objectives. It goes beyond the conventional classroom setting, transforming theoretical knowledge into practical skills. Engaging in the design, development, and implementation of a satellite is an educational journey that extends beyond standard academic assessments. It provides a dynamic and interactive learning platform where we actively contribute to the creation of a tangible technological solution.

Significance of Atmospheric Exploration:

At the core of our project lies the exploration of atmospheric conditions. The CanSat, equipped with sensors measuring temperature, pressure, and altitude, embodies our commitment to deciphering the intricate dynamics of Earth's atmosphere. The collected data is not just numerical values; it represents a deeper exploration into

environmental science and scientific research. Our CanSat serves as a scientific tool, contributing to our understanding of the world around us.

Benefits Derived from the Project:

The CanSat project unfolds numerous benefits, offering an enriching learning experience that extends far beyond technical know-how. It becomes a skill-building odyssey where the complexities of electronics, programming, and systems integration become our classroom. Beyond the technical skills, the project fosters the development of crucial soft skills such as problem-solving, teamwork, and project management – skills that are indispensable in our future professional endeavors. The project becomes a holistic learning experience, shaping us not only as engineers but as well-rounded individuals ready to tackle real-world challenges.

Integration with Circuit Design:

As we delve into the technical aspects, the CanSat project's significance is further underscored by the integration of a comprehensive circuit design. This circuit becomes more than just a set of interconnected components; it is the visual representation of our educational journey. The intricate connections powering our CanSat symbolize the fusion of theoretical foundations and hands-on exploration. The circuit design is a testament to our commitment to practical learning and the application of theoretical knowledge in real-world scenarios. It encapsulates the essence of our educational odyssey with the CanSat project, highlighting the synergy between theoretical understanding and practical application.

Project Details:
Sensors and Materials Used:

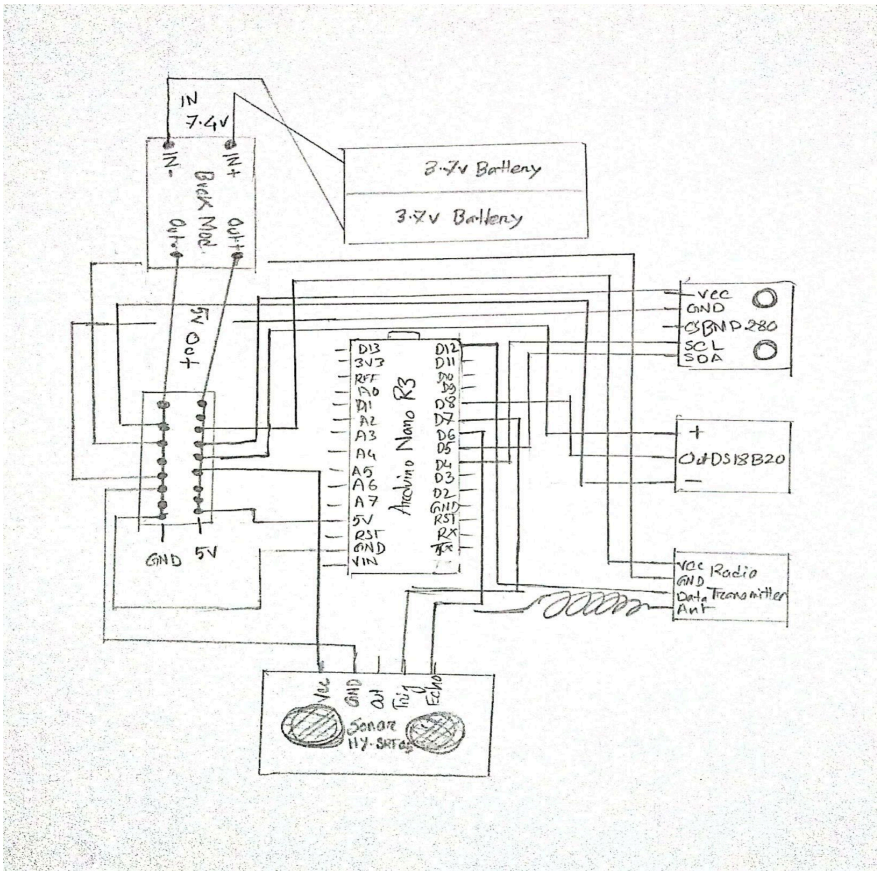
1. Arduino Nano
2. Temperature Sensor DS18B20
3. Radio Transmitter & Receiver
4. Pressure Sensor BMP280
5. Sonar HYSR505
6. 5v Lipo Battery
7. Voltage Converter
8. Jumper Wires

Project Working Mechanism with Circuit Diagram:

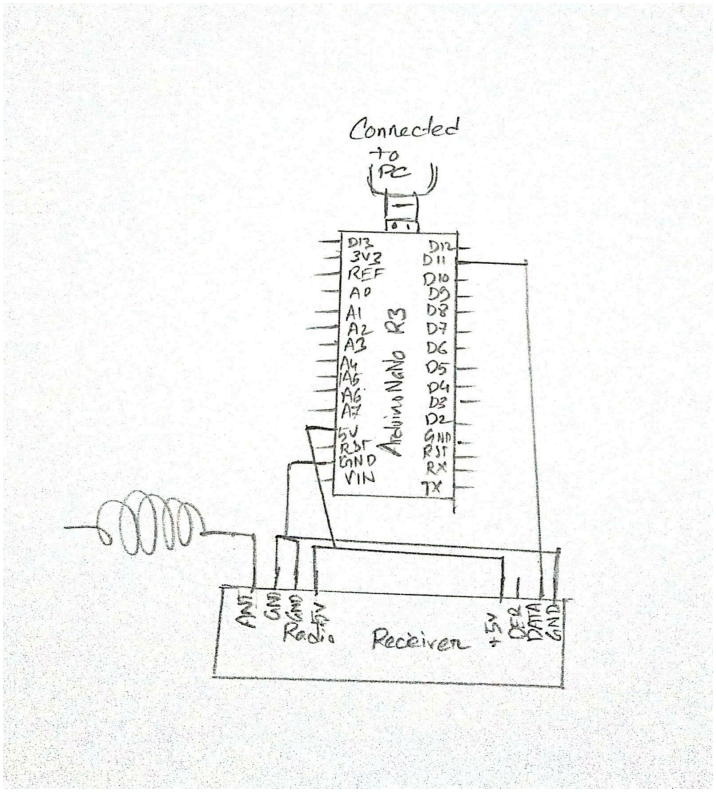
The CanSat project's working mechanism is intricately designed, with a comprehensive set of components seamlessly integrated to measure atmospheric conditions. On the transmitter side, the Arduino Nano acts as the central processing unit, orchestrating the functionalities of the BMP280 pressure sensor for atmospheric pressure measurements, the RF Transmitter for wireless data transmission, a dual 3.7V battery source powering all components, a Buck Module for stable voltage regulation, the DS18B20 Temp Module for ambient temperature measurements, the Sonar Hy-SRF05 for precise altitude readings, and a breadboard facilitating component connections. The circuit diagram illustrates the collaborative interplay of these elements, depicting how data flows from the sensors through the Arduino Nano and is transmitted by the RF Transmitter. On the receiver side, an Arduino Nano processes incoming data received by the RF Receiver. The receiver side circuit, depicted on a breadboard, illustrates the configuration that allows for the reception and interpretation of transmitted atmospheric data. Together, these components and their connections form a holistic system that captures, processes, and transmits valuable information about the environment. The circuit diagram is detailed in Figure 1.

Circuit Diagram:

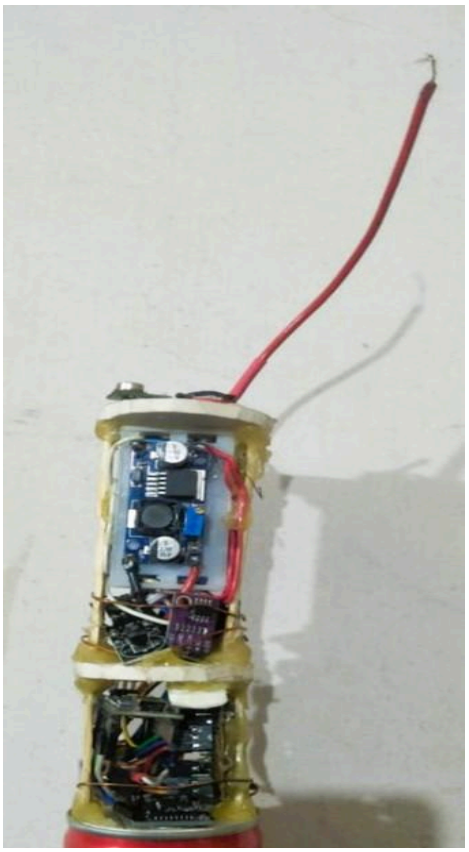
Transmitter Circuit:

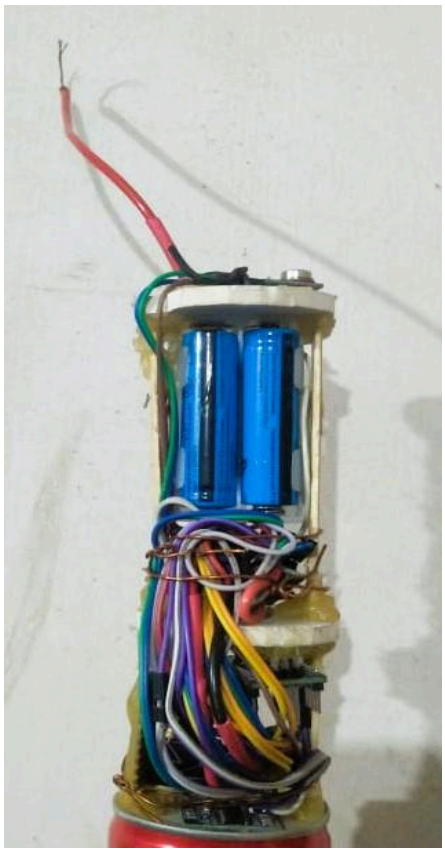


Receiver Circuit:



Project Images:





Project Cost Analysis:

The cost breakdown of the project components is as follows:

1. Arduino Nano X 2: 1000 taka
2. Temperature Sensor DS18B20: 220 taka
3. Radio Transmitter: 200 taka
4. Pressure Sensor BMP280: 250 taka
5. Sonar HYSR505: 250 taka
6. 5v Lipo Battery: 600 taka
7. Battery Holder: 50 taka
7. Voltage Converter: 230 taka

Total Cost: 2800 taka
Weight(without Parachute): 300 grams
Weight(with Parachute): 350 grams

Member Contributions:

- S. M. Mushfiq Reza: Mechanical Design and Implementation.
- Amreen Rahman: Mechanical Design and Implementation.
- Rezuana Imtiaz Upoma: Cansat Arduino Coding.
- Shamsil Arafin Ullah: Communication Implementation.
- Shad Been Sharif Sami: Ground Control Implementation.

Future Work:

As we conclude our CanSat project, the journey sparks contemplation on avenues for future enhancements and expansions. The current iteration has laid a solid foundation for potential improvements and additional features. One promising avenue for future work involves the integration of a camera module. Incorporating a camera into the CanSat payload could provide a visual dimension to our atmospheric exploration. This addition could enable the capture of images or videos during the descent phase, offering a unique perspective of the environment. This visual data could complement the existing sensor measurements, providing a more comprehensive understanding of atmospheric conditions.

Furthermore, the integration of a GPS module represents another exciting prospect for future development. Adding GPS capabilities to the CanSat would enable precise tracking of its location throughout the mission. This enhancement could facilitate the correlation of sensor data with specific geographical coordinates, enhancing the accuracy and spatial context of the collected information. Such data could be invaluable for mapping and analyzing environmental changes in different locations.

In terms of software, refining the data processing algorithms and implementing real-time data transmission could enhance CanSat's responsiveness and efficiency. Improving the onboard data processing capabilities could enable the CanSat to perform more complex computations, allowing for the real-time analysis of environmental variables during the mission.

Considering the power aspect, exploring alternative and more energy-efficient power sources could extend the operational lifespan of the CanSat. Investigating the feasibility of solar panels or energy harvesting mechanisms could potentially reduce the reliance on conventional batteries and increase the sustainability of the CanSat missions.

In conclusion, the future of our CanSat project holds exciting possibilities. The addition of a camera, GPS module, advancements in data processing, and exploration of alternative power sources present compelling avenues for further innovation. These potential enhancements could elevate the CanSat project to new heights, expanding its capabilities and contributing to a more nuanced understanding of atmospheric dynamics. The iterative nature of such projects invites continuous improvement, fostering a dynamic and ever-evolving journey of exploration and learning.

Integration with Academic and Professional Growth:

Our participation in the CanSat project extends beyond the immediate confines of our academic curriculum. It is a preparation for the future, offering insights and practical wisdom that will undoubtedly prove invaluable as we navigate the evolving landscapes of aerospace engineering, research, and technological innovation. The project serves as a practical bridge between classroom knowledge and real-world challenges, cultivating not only technical expertise but also crucial soft skills such as problem-solving, teamwork, and project management. The multifaceted nature of the CanSat project prepares us for the dynamic and interdisciplinary demands of the aerospace industry, laying the groundwork for a future where our insights and experiences in hands-on projects will contribute to advancements in satellite technology and environmental monitoring.

Conclusion:

In drawing the curtains on our CanSat project, we reflect upon a journey marked by exploration, discovery, and collaborative learning. This endeavor has transcended the boundaries of conventional education, providing us with hands-on experience in satellite design and atmospheric exploration. As a group, we navigated the intricate landscape of electronics, programming, and systems integration, transforming theoretical knowledge into practical skills.

The CanSat, with its array of sensors measuring temperature, pressure, and altitude, served as our miniature emissary into the complexities of Earth's atmosphere. It became more than a project; it embodied our commitment to understanding the world around us and contributing to scientific knowledge. Our decision to venture into the integration of a comprehensive circuit design showcased our dedication to the synergy between theory and practice. As we contemplate future work, the prospect of integrating a camera module, GPS capabilities, and refining data processing algorithms opens new frontiers for innovation. These envisioned enhancements hold the promise of elevating the CanSat project to new heights, broadening its capabilities, and contributing to a deeper understanding of atmospheric dynamics. Beyond the technical aspects, our participation in the CanSat project has been a preparation for the future, offering insights and practical wisdom that extend beyond academic confines. It has equipped us not only with technical expertise but also with invaluable soft skills essential for success in the professional realm.

The CanSat project stands as a testament to our collective commitment to hands-on learning, exploration, and innovation. It has been a dynamic and ever-evolving journey, paving the way for future endeavors where our insights and experiences will undoubtedly contribute to advancements in aerospace engineering and scientific exploration. As we close this chapter, we look forward to the continued growth, both individually and as a group, inspired by the possibilities unlocked during our CanSat odyssey.

References:

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