Soil Monitoring Using CubeSat

Capstone 2.0 - Team 08:

Abdullah Albaqer (EE) **Abdulmalik Alghanmi (EE)**
Bassam Aldar (EE) **Yousef Almodhi (ICS)**

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OBJECTIVE

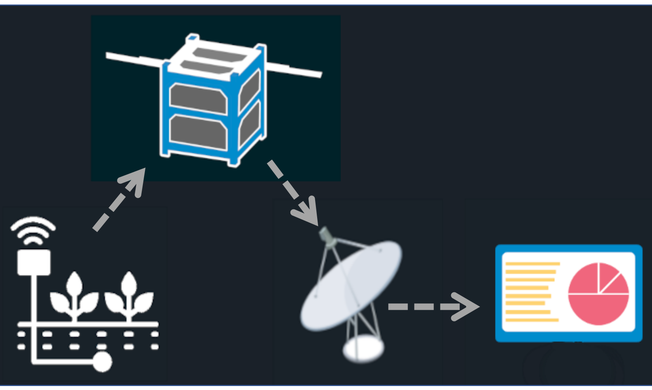
The objective of this project is to develop a decision-making tool to reduce carbon emissions of Saudi Arabia by planting trees across the country utilizing a space solutions

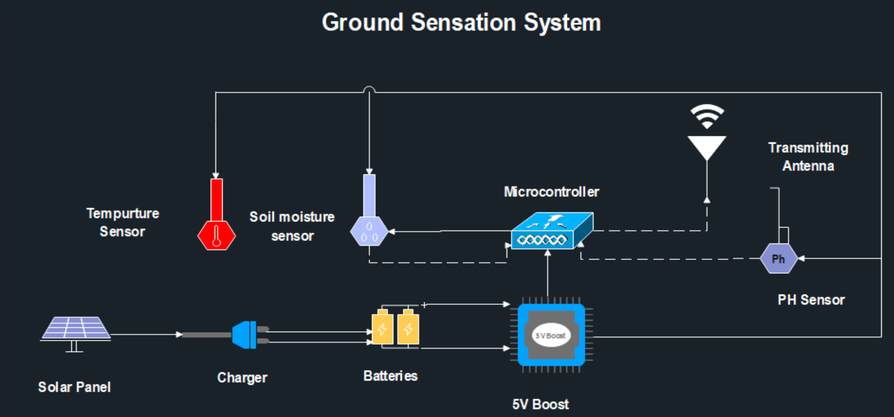
SPECIFICATIONS & CONSTRAINTS

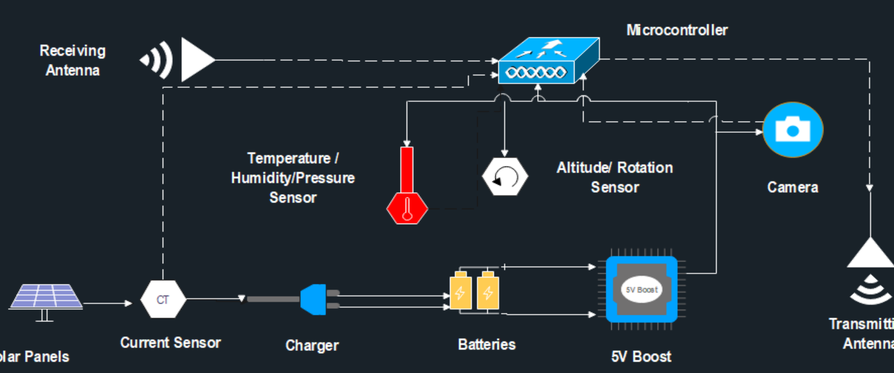
Subsystem	Constraints
Ground Sensation Station (GSS)	High temperature weather.
	Remote location.
	Dust and wind in the position of the system.
CubeSat	Mass must be less than 1.33 Kg.
	Must be a 1-U CubeSat (at most 10 x 10 x 11.35 cm).
	CubeSat Frame.
	The CubeSat must be self-powered.
Ground Station (GS)	Software compatibility with microcontroller.

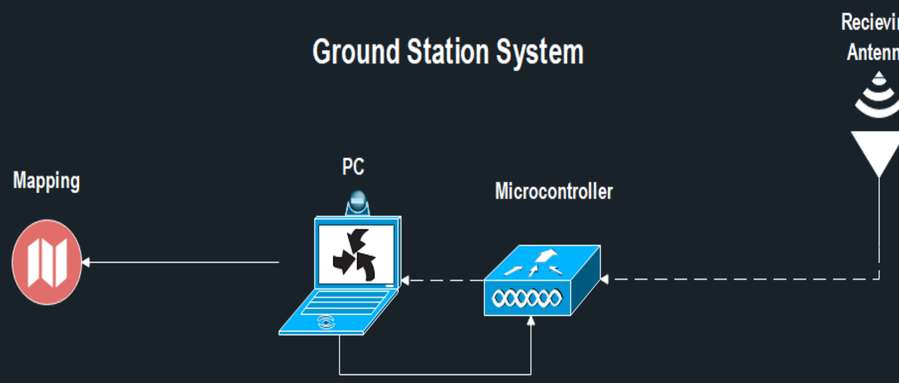
Subsystem	Targeted Specification
Ground Sensation Station	1W < Power < 2W
	Battery Life > 10 hrs
	Data rate > 720 bps
CubeSat	Power consumption < 4Watts
	Reflection data time < 10s
	11.3cm < Height < 11.35cm, Width < 10cm, Length < 10cm
	Transmission Power < 100mW
Ground Station	Processing delay < 6s

PROTOTYPE DESIGN









VERIFICATION & VALIDATION OF MEETING THE SPECIFICATIONS

- Using the telemetry from the CubeSat a Calculation of the power was done and it met the specification with power consumption of 2.412 W
- A calculation of the power from the solar and the power consumption ensure that the battery life will exceed 10 hours
- The time for transmission and processing of sensors data met the goal within less than
- The achieved data rate is more than 3 times the specification target

DESIGN REVIEW

- The project was reviewed and verified by KACST experts.

COMMERCIALIZATION

- Saudi Aramco experts considered this idea of the project as the best solution for increasing the green landscape.

CONCLUSION & FUTURE RECOMMENDATIONS

- The three Subsystems met the specifications and provided good performance.
- The CubeSat proved that it is a valid Solution for monitoring the soil in remote areas by sending numerical and visual data to Ground Station.
- The cost for installing Ground Sensation Station is relatively low compared to other solution.
- For future recommendations, using gateways between different GSS to reserve both cost and energy