The FemtoTX Motherboard Standard

A solar-powered, Raspberry Pi-like Board idea that runs on 5mW

Giovanni

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Giovanni

Andreas Eriksen

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HARDWARE

ONGOING PROJECT

This project was created on 02/15/2021 and last updated 3 days ago.

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DESCRIPTION

Welcome to a solar system! (why not "my" solar system"? because it's yours!

https://github.com/EI2030/Low-power-E-Paper-OS

Building a consensus on a credit card sized ATX standard with:

1. Solar Power & Battery Management
https://www.tindie.com/products/jaspersikken/solar-harvesting-into-lithium-ion-capacitor/

2. MCU & Memory PCB Design:
https://www.sparkfun.com/products/15444 "And runs at less than 1mA"
https://www.tsmc.com/english/dedicatedFoundry/technology/logic/l_22nm
https://www.cmc.ca/globalfoundries-22fdx-fdsoi-22-nm/

3. Linux/RTOS software development
https://github.com/hatonthecat/linux_distro_tests
https://github.com/kragen/dernocua/blob/master/text/energy-autonomous-computing.md

4. E-paper/Reflective Display driver (larger screens sought!)
https://www.youtube.com/watch?v=BD4At2-e87E SHARP Memory in Pixel 4.4" RLCD LPM044M141A

DETAILS

This section can be used to explain everything about your project.

7-12-2024

Brainstorming Draft Specs to develop "FemtoTX" and "AttoTX" form factor

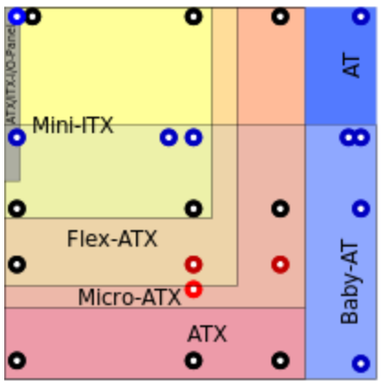
https://en.wikipedia.org/wiki/Small_Form_Factor_Special_Interest_Group

"FemtoTX" (fTX) could be used for tablets and laptops, whereas "AttoTX" aTX) could be for cell phones, and at least small enough to be in a keycard or usb drive. Though there could be an overlap so that attoTX can also fit on a femtoTX mounting holes (similar to mini-ITX fitting on 4 of 9 Micro holes.

micro	μ	10^{-6}	0.000001	1873
nano	n	10^{-9}	0.000000001	1960
pico	p	10^{-12}	0.000000000001	
femto	f	10^{-15}	0.000000000000001	1964
atto	a	10^{-18}	0.000000000000000001	

from:

https://en.wikipedia.org/wiki/Metric_prefix#List_of_SI_prefixes (chosen for easy reference/continuity, rather than arbitrarily small form factor concept)



"The Mobile-ITX form factor was announced by VIA Technologies at Computex in June, 2007. The motherboard size of first prototypes was 75 × 45 mm (3.0 × 1.8 in).[2] The design was intended for ultra-mobile computing such as a smartphone or UMPC."

https://en.wikipedia.org/wiki/Mobile-ITX

Embedded

- EPIC (Express) (165×115)
- ESM (149×71)
- Nano-ITX (120×120)
- COM Express (125×95)
- ESMexpress (125×95)
- ETX (114×95)

- Pico-ITX (100×72)
- PC/104 *(-Plus)* (96×90)
- ESMini (95×55)
- SMARC (82×80)
- Qseven (70×70)
- mobile-ITX (60×60)
- CoreExpress (58×65)

60mm is 2.3622" and that might be too large for a mobile phone at least for a square dimension. 40x40mm = 1.57x1.57" and might be simpler for a smaller form factor, but perhaps too small for femtoTX and too large for attoTX.

The Sparkfun Nano, for example (see pictures) is 49mmx21mmx7mm (1.92"x0.82"x0.27"):

https://www.distrelec.biz/en/redboard-artemis-nano-development-board-76v-sparkfun-electronics-dev-15443/p/30160886 Narrow and thin enough to fit in a phone and long enough for additional headers. A boxier one would not as flexible with most cell phones (as 1.9 wide would leave little space for the side of the cell phone. Two mounting holes could be used, however, and doubling the width to 50x50mm or 49x49mm might be ideal for femtoTX, which could have the same distance between mounting holes for all 4.

By comparison, the Raspberry Pi 3-4 is around 85x56x17mm (l x w x h): https://www.waveshare.com/raspberry-pi-4-model-b-8gb-ram.htm

	ZERO	ZEROW/ WH	3A+	3B	3B+	4B
SOC	BCM2835			BCM2837B0		BCM2711B0
CPU	ARM11 Single-core 700MHz			ARM Cortex-A53 Quad-core (3B 1.2GHz, 3A+/3B+ 1.4GHz)		ARM Cortex-A72 Quad-core 1.5GHz
GPU	Broadcom VideoCore IV@400MHz					Broadcom VideoCore IV@500MHz
RAM	512MB			512MB	1GB	Choice of 2GB/4GB/8GB
USB	1x micro USB			1x USB2.0	4x USB2.0	2x USB2.0 + 2x USB3.0
HDMI	Micro HDMI			HDMI		Mini HDMI
Bluetooth	N/A	Bluetooth 4.1		Bluetooth 4.2	Bluetooth 4.1	Bluetooth 4.2	Bluetooth 5.0
WiFi	N/A	802.11 b/g/n		3B: 802.11 b/g/n, others: 802.11 b/g/n/ac 2.4GHz/5GHz dual band		
Ethernet	N/A			100Mbps		300Mbps (USB)	1000Mbps
PoE	N/A					Yes	
Power Input	Micro USB (5V 2.5A)						USB Type-C (5V 3A)
Dimensions	65 × 30 x 5 mm			65 × 56 mm	**85 x 56 x 17 mm**		

The PicoITX (, a common embedded format, is slightly larger than the newer Raspberry Pis, but not by much:

- Pico-ITX (100×72)

Description Details Files 133 Components 0 Logs 14 Instructions 2 Discussion 2

ROCK PI E: 56 x 65 mm, or 2.5 x 2.2 in

(2020) Radxa's latest single-board computer is a tiny system that measures just 65mm x 56mm (2.6″ x 2.2″). It's called the **Rock Pi E** and it features a Rockchip RK3328, support for up to 2GB of RAM, and an eMMC socket and microSD card reader that you can use for storage."
https://liliputing.com/the-24-rock-pi-e-is-a-tiny-quad-core-computer-for-headless-applications/

https://wiki.radxa.com/RockpiS:

- "The measurement is 1.7 x 1.7 inches (38.1 x 38.1 mm)."

https://www.electronics-lab.com/an-overview-of-rock-pi-s-v1-3/

Having used a RockPi S, it seems acceptably small without being too wide. Whether...

Read more »

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FILES

Add and manage files for this project.

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Market Research 2024.pdf

Charts included (see previous attachment for corrected margins)
https://www.cognitivemarketresearch.com/computer-motherboard-market-report

Adobe Portable Document Format - 7.10 MB - 09/14/2024 at 03:00

The Global Computer Motherboard market size was USD 18.5 billion in 2023!.pdf

https://www.cognitivemarketresearch.com/computer-motherboard-market-report

Adobe Portable Document Format - 1.62 MB - 09/14/2024 at 02:52

lineup_from_draft_rev3_jdi_gr_mip_reflective_color_lcd_and_standard_products_20180219-3.pdf

Adobe Portable Document Format - 397.08 kB - 09/13/2024 at 17:47

attoTX 2-module with Standard Power Connector and mounting holes and measurements.jpg

attoTX concept 1 (could be used for FemtoTX

JPEG Image - 1.39 MB - 08/10/2024 at 23:45

Model b.png

Portable Network Graphics (PNG) - 2.32 MB - 08/10/2024 at 08:47

Edit Files

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COMPONENTS

You can list the components you used in your project here.

Add components

PROJECT LOGS

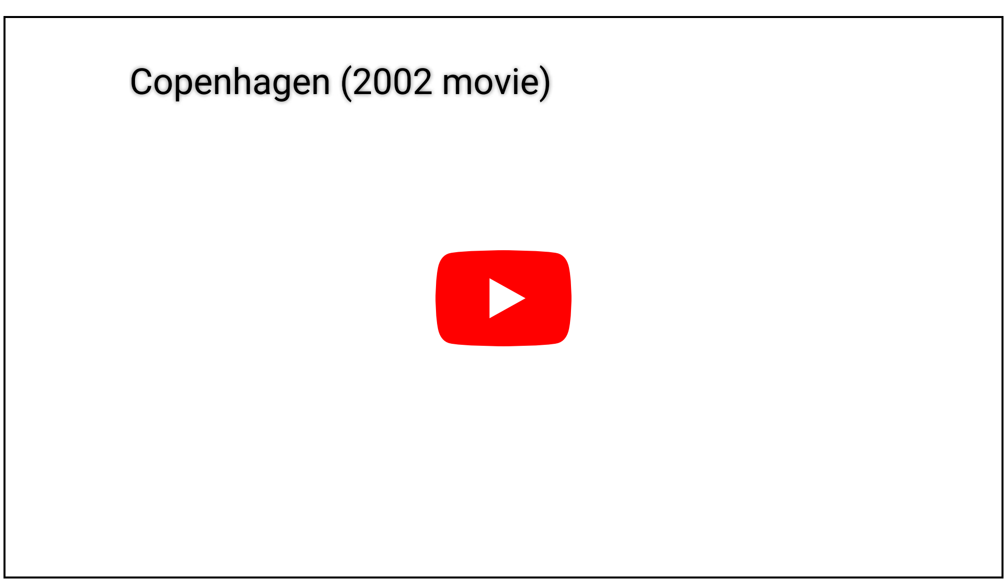
Project logs can be used to keep your followers up to date about your project.

Thought Experiment

Giovanni • 3 days ago • 0 comments

https://github.com/hatonthecat/Solar-Kernel?tab=readme-ov-file#copenhagen

The theory, analogy, and metaphor is- solar powered computers are possible, but most have just not realized there was a calculation to be made. (From Copenhagen, 2002, BBC4)



https://youtu.be/RTn9eKfH11M?t=5719 (skip to 1:35:03)

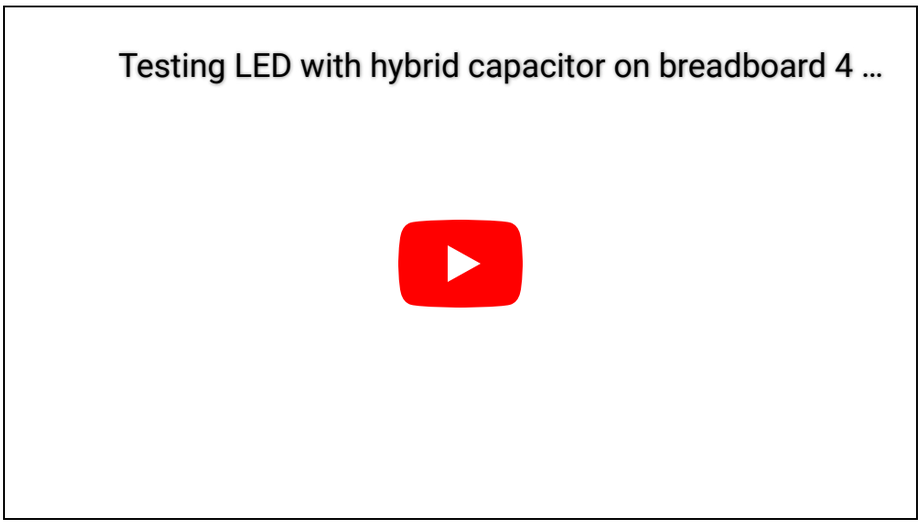
Thought Experiment

https://github.com/hatonthecat/Solar-Kernel?tab=readme-ov-file#copenhagen

The theory, analogy, and metaphor is- solar powered computers are possible, but most have just not realized there was a calculation to be made. (From Copenhagen, 2002, BBC4)

Lithium Ion Hybrid Capacitor Circuit & LED Test

Giovanni • 08/28/2024 at 14:51 • 0 comments



I successfully tested the Ymin 10mAh, 20 Farad lithium capacitor- it runs continuously and it hasn't been recharged since I received it. Next step is testing a variable resistor, a potentiometer which is pictured in the 1st and 3rd videos to toggle the dimness. I also tested positively a 12V car W5W "dome" LED light that I bought from eBay in 2017 - a 10 pack for $0.99- unsure what kind of voltage it uses (when connected to this breadboard), but similar ones use around 0.2Watts. Green LEDS (not the tinted aspect) use the least power, though using green for everything isn't always preferred.

Add a project log

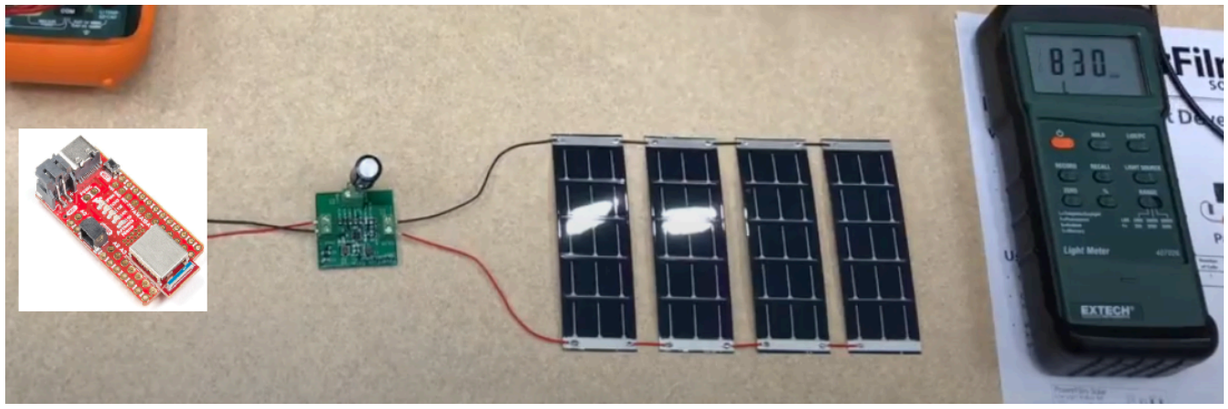
View all 14 project logs

BUILD INSTRUCTIONS

Build instructions can be used to create step by step how-to guide for your project.

Step 1

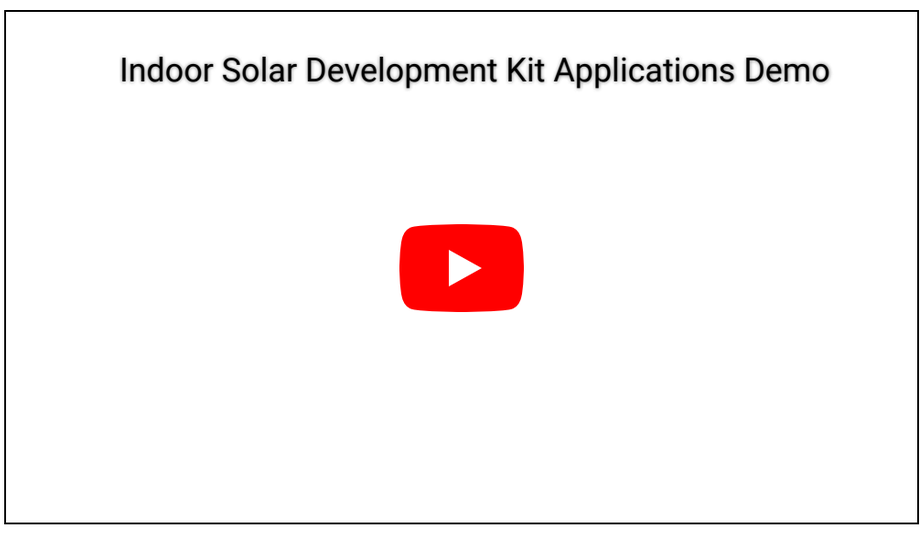
These are not build instructions but build concepts.
Goal #1: Power a Sparkfun Artemis board on 4 Powerfilm LL200-2.4-75or 3-37 (x2 or x4):



by using:
1. Sparkfun Artemis board https://www.sparkfun.com/products/15443
and
https://www.powerfilmsolar.com/products/development-kits/solar-development-kit (DEV-BASIC)
uses BQ25570 and includes (2) LL200-3-37 Indoor Solar Panel with 6” leads
or https://www.powerfilmsolar.com/products/development-kits/aem-pf-evk-solar-development-kit-with-e-peas-pmic
uses AEM10941 harvester:

- AEM-PF-EVK Dev Kit PCBA (and includes (2) LL200-2.4-37 Indoor Solar Panel with leads)
- a battery can be used in place of the supercapacitor. This image was used to demonstrate the panels can be wired in parallel. Earlier in the video they use a 40mah battery, which could be used here, or a larger one (100mah), for example.

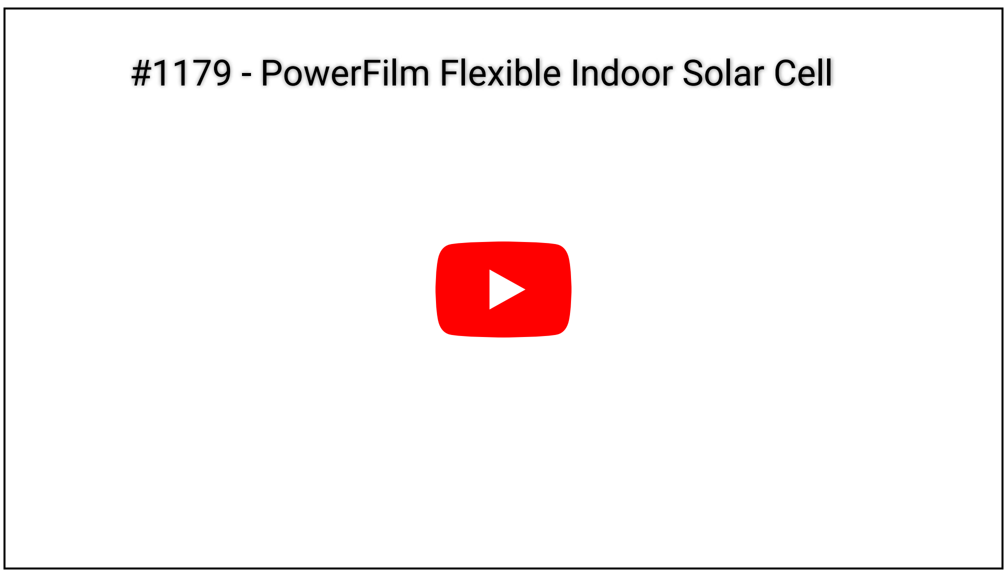
Additional panels can be purchases separately from Digikey & Mouser. Other BQ25570 chargers include Mikroe-2814:
https://www.arrow.com/en/products/mikroe-2814/mikroelektronika?gclid=Cj0KCQiAmfmABhCHARIsACwPRADBziDNW74RhE4C6A4Bf8bEsCRlMSrswfLfvO-a-cDouq-HHLcOQ2MaAhDSEALw_wcB
and off-brand BQ25570: https://www.ebay.com/itm/184366178954
A Tindie seller for AES10941 https://www.tindie.com/products/jaspersikken/solar-harvesting-into-li-ion-battery/
Demo:



By acco[illegible] this [illegible] ca[illegible] demo[illegible] not j[illegible] blue[illegible] but a microcontroller capable of running GUI-based applications on a number of solar panels inside continuously, without relying on sleep programming. The goal of this is to be a computer that one can access and see a stream of emails incoming, and not it have to shut off for long boot up times.
Jasper Sikken, who sells an AEM10941 harvester on Tindie, has said on his project page (Thank you!): https://hackaday.io/project/159139-tiny-solar-energy-module-tsem :

"Jasper Sikken wrote 4 hours ago

You seem to understand my calculations to estimate the amount of daily harvested energy. The AEM10941 input voltage range is max 5V. You need to make sure that the open circuit voltage does not exceed 5V. That often means you need to select 4V or less NOMINAL voltage. Either you put 1 or more 4V solar panels in parallel or put a few lower voltage cells in series. Note that a partial shade on a series string causes the whole string to malfunction. Also note that AEM10941 efficiency drops with solar panel voltage below 1V. So a tradeoff is to select about 2.0V nominal voltage and if you want more power you add more in parallel"
Additional Powerfilm Dev-Kit Review:



Step 2. Add a display

Power an e-ink or reflective display and the Artemis board connected to the Artemis board's SPI pins using 4-6 panels.

Edit Instructions

View all Instructions

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DISCUSSIONS

e64 wrote 07/01/2024 at 20:55 · 1 point

please add more ram 512K is ok for start.

and meybe a meshtastic.org / reticulum.network Lora network for emergency communications

reply

Giovanni wrote 07/01/2024 at 20:55

https://www.top-electronics.com/en/apollo3-blue-plus-soc-96-mhz-768kb-bga

https://www.top-electronics.com/en/apollo4-blue-plus-192-mhz-2-75mb-bga

https://www.top-electronics.com/en/apollo510-soc-250mhz-3-75mb-wlcsp

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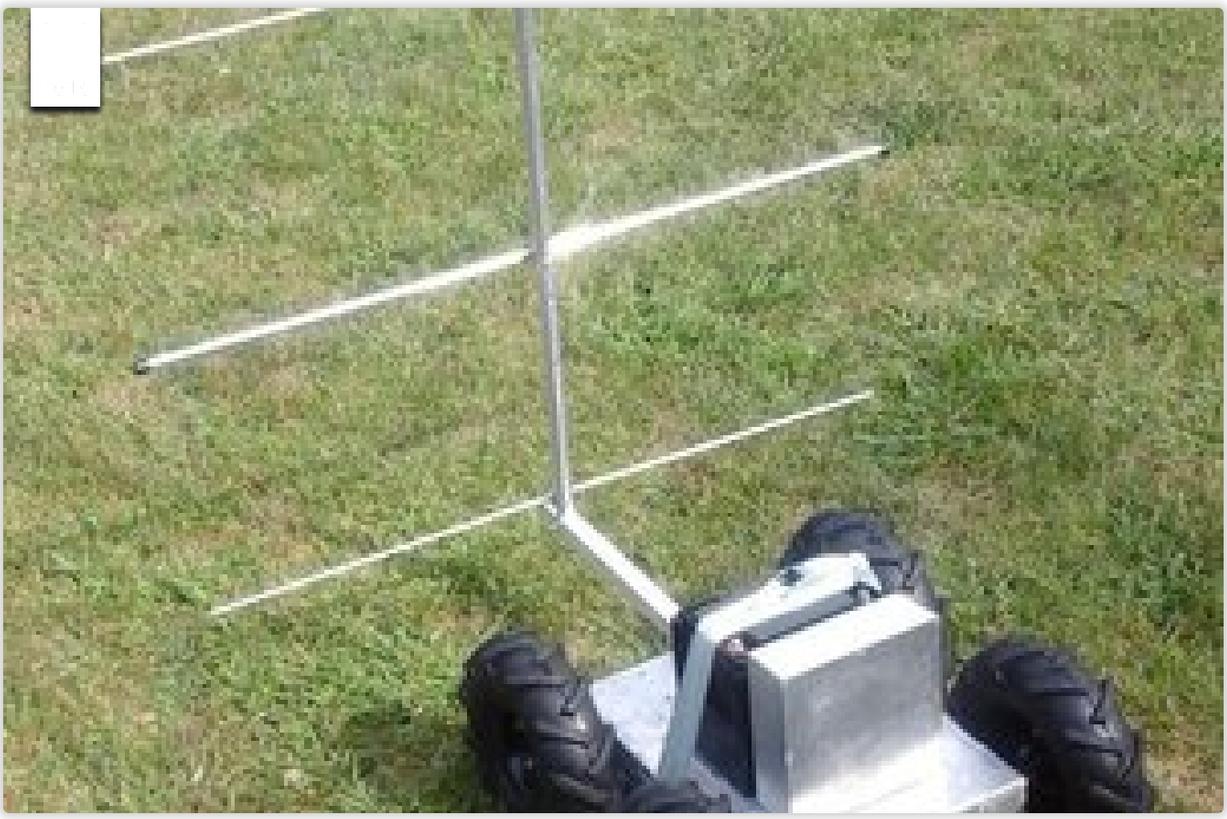
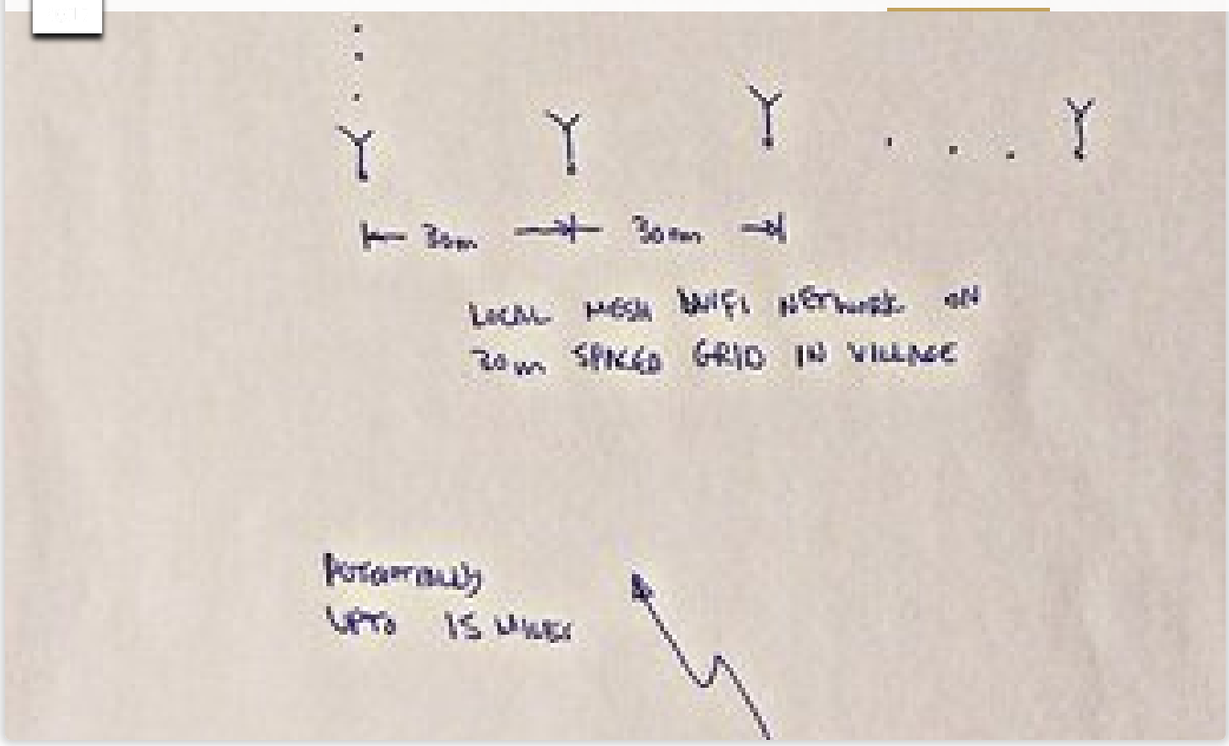
SIMILAR PROJECTS



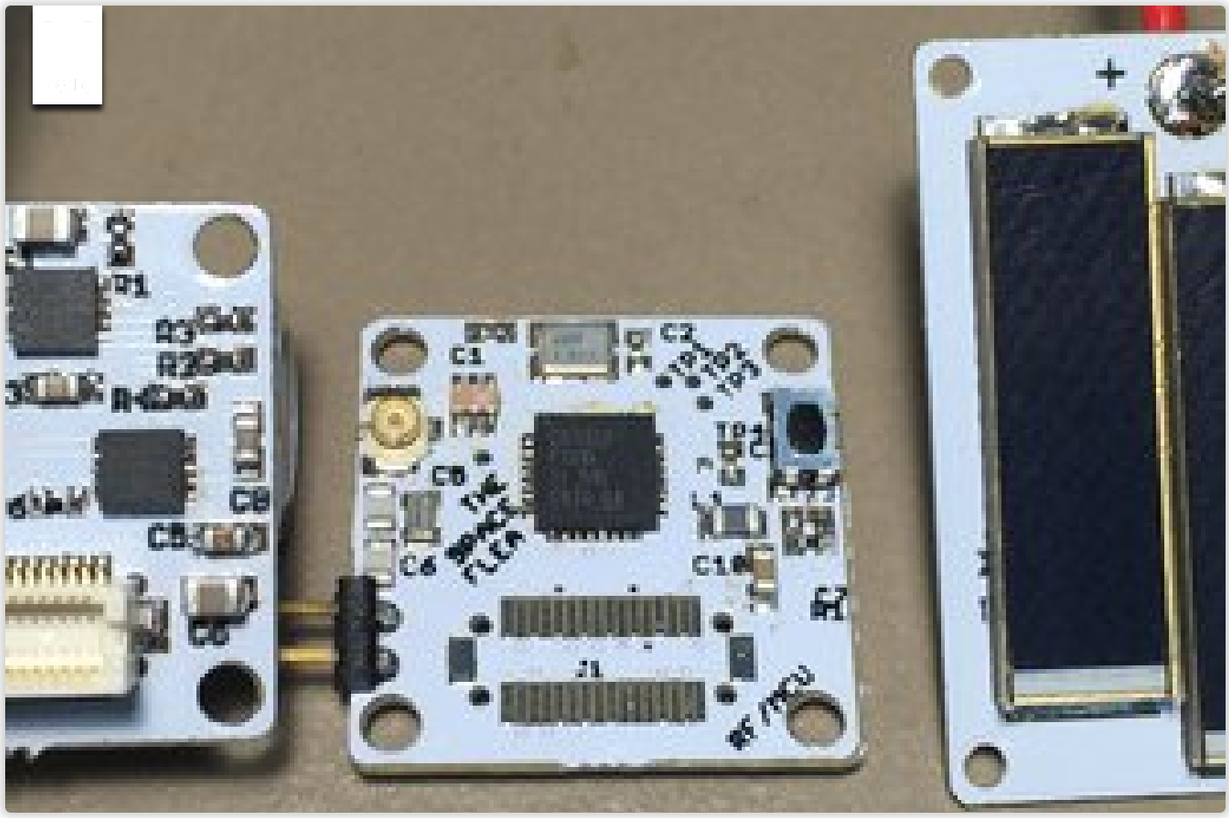
Open Ground Penetrating Radar

Glenn Powers



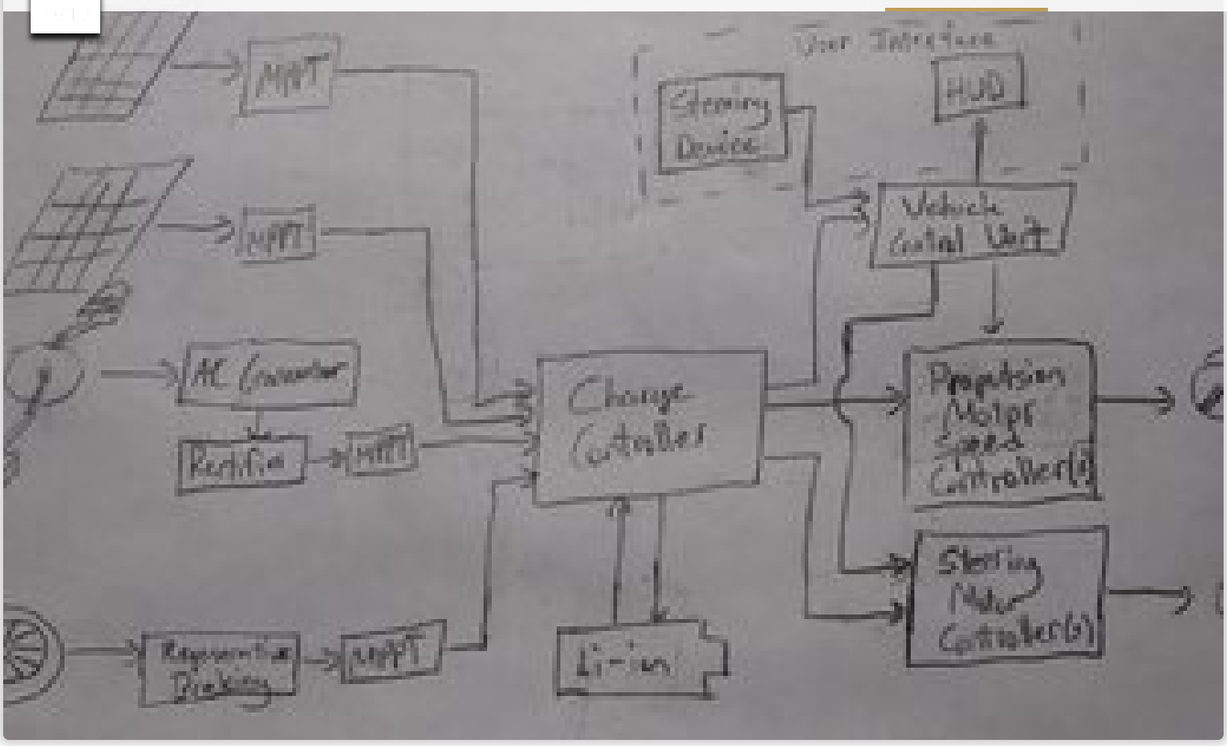
CEMN - Community Engagement Mesh Network

hlew



The Space Flea

OzQube



Open-Source Personal Electric Vehicle


Brian Gilbert

Going up?

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