

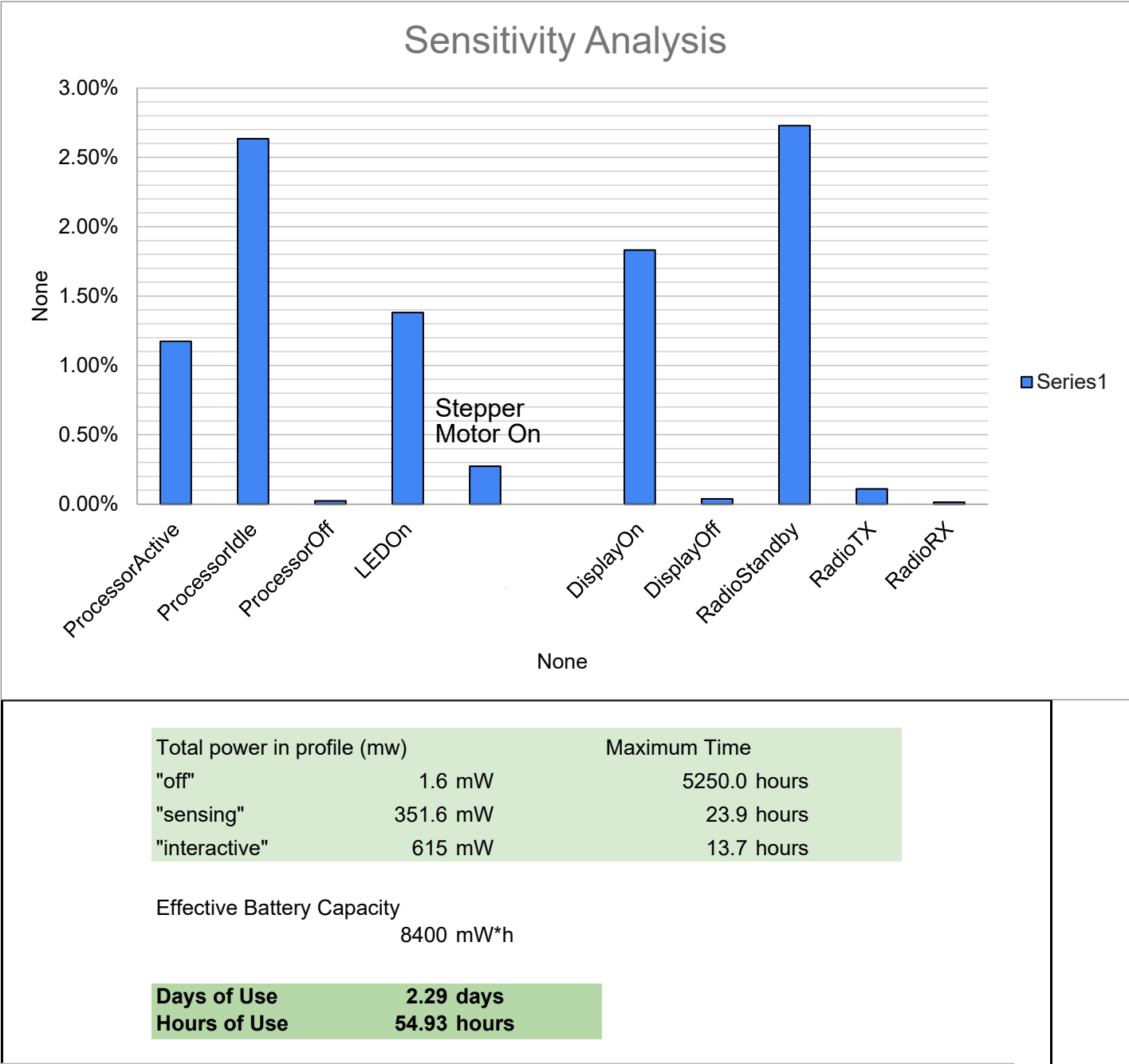
Display Device

System Parameters (defined by hardware)		Profiles (usage of each component mode - defined by software and usage)		
form the datasheets		"off"	"sensing"	"interactive"
Processor	https://github.com/Jingyii800/Hydration-Companion/blob/main/data_sheets/esp32-s3_datasheet.pdf			
Active	198 mW	0%	20%	50%
Idle	120 mW	0%	80%	50%
Sleep	0.6 mW	100%	0%	0%
LED	https://github.com/Jingyii800/Hydration-Companion/blob/main/data_sheets/1498852.pdf			
On	50 mW	0%	100%	100%
Stepper Motor	https://github.com/Jingyii800/Hydration-Companion/blob/main/data_sheets/Stepper-motor2424.pdf			
On	200 mW	0%	0%	100%
Idle	0 mW	0%	0%	0%
Off	0 mW	100%	0%	0%
Display	https://github.com/Jingyii800/Hydration-Companion/blob/main/data_sheets/SSD1306.pdf			
On	66 mW	0%	100%	100%
Off (leakage)	1 mW	100%	0%	0%
Radio	https://github.com/Jingyii800/Hydration-Companion/blob/main/data_sheets/esp32-s3_datasheet.pdf			
Data Rate	500K bps	0%	0%	0%
Standby Power	100 mW	0%	100%	50%
TX Power	200 mW	0%	0%	40%
RX Power	100 mW	0%	0%	10%
Battery	4 * AA batteries with regulator	14	9.5	0.5 hours/day typical usage
Capacity	2000 mAh			
Nominal Voltage	6 V			
Regulator Efficiency	70%			

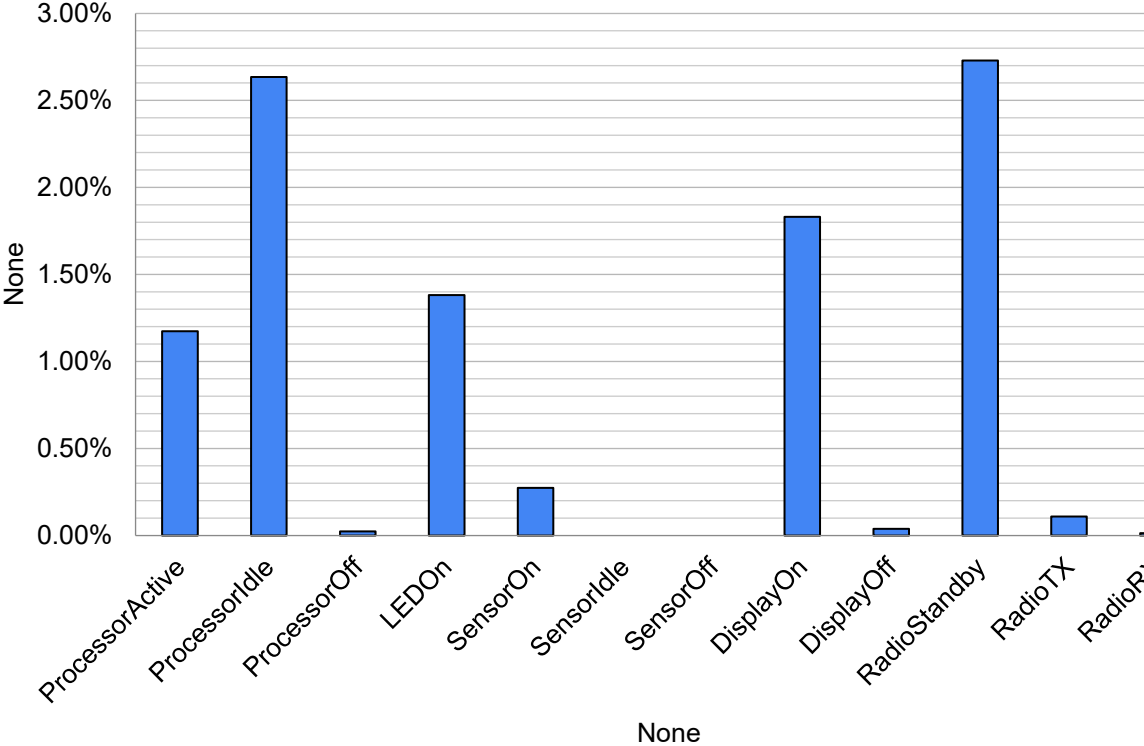
Days of Use Metric:
The "days of use" metric was determined by calculating the effective battery capacity, considering the regulator efficiency, and then dividing by the total power consumption per day for the usage profile defined. With a regulator efficiency of 70% and a battery capacity of 2000 mAh at 6V, the effective battery capacity is 8400 mW*h. By comparing this against the total power consumed in different profiles, it can estimate the number of days and hours the device can operate before the battery needs recharging or replacing.

Optimum Size for the Battery:
Given the device's current configuration and usage, the 4 * AA batteries with a capacity of 2000 mAh seem to be a reasonable choice, providing over 2 days of continuous use in the most demanding 'interactive' profile and significantly longer in the 'off' or 'sensing' modes.

Hardware/Software/Cost/Effort Trade-offs:
Hardware: Using a more energy-efficient OLED screen or a stepper motor with lower power consumption could extend battery life. Another hardware consideration could be integrating an energy harvesting component, like a solar cell, to extend battery life or even eliminate the need for batteries in some environments.
Software: Implementing a more aggressive sleep mode management in the software could reduce power consumption when the device is idle. For example, reducing the frequency of updates or implementing a motion-activated wake-up could minimize energy use without significantly impacting user experience.
Cost: While higher-capacity batteries or more energy-efficient components might increase the cost, they could also improve the user experience by requiring less frequent charging. Additionally, software optimizations typically do not increase the hardware cost and can be a cost-effective way to improve power management.
Effort: Investing in software development for intelligent power management could be less resource-intensive than hardware changes. For instance, creating a low-power communication protocol between the sensor device and the display could reduce the energy required for data transmission.



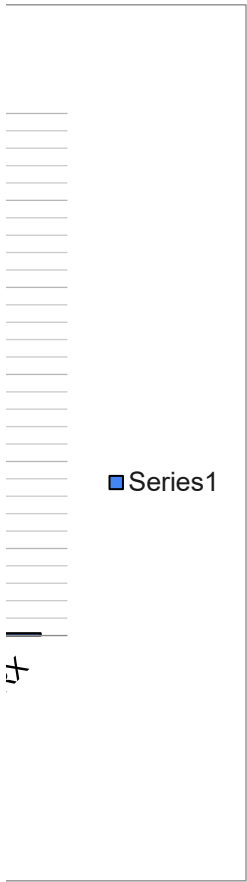
Sensitivity Analysis



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System Parameters	0	0	0		
0 form the datash	0	0	0		
0	0	0	0		
Processor	https://github.cc	0	0		
Active	198 mW	178.2	198	198	198
Idle	120 mW	120	108	120	120
Sleep	0.6 mW	0.6	0.6	0.54	0.6
0	0	0	0	0	0
LED	https://github.cc	0	https://github.cc	https://github.cc	https://github.cc
On	50 mW	50	50	50	45
0	0	0	0	0	0
0	0	0	0	0	0
Stepper Motor	https://github.cc	0	https://github.cc	https://github.cc	https://github.cc
On	200 mW	200	200	200	200
Idle	0 mW	0	0	0	0
Off	0 mW	0	0	0	0
0	0	0	0	0	0
Display	https://github.cc	0	https://github.cc	https://github.cc	https://github.cc
On	66 mW	66	66	66	66
Off (leakage)	1 mW	1	1	1	1
0	0	0	0	0	0
Radio	https://github.cc	0	https://github.cc	https://github.cc	https://github.cc
Standby Power	100 mW	100	100	100	100
TX Power	200 mW	200	200	200	200
RX Power	100 mW	100	100	100	100
0	0	0	0		
0	0	0	0		
Battery	4 * AA batteries	0	0		
Capacity	2000 mAh		0		
Nominal Voltage	6 V		0		
Regulator Efficiency	70%	0	0		

[illegible]



198	198	198	198	198	198	198
120	120	120	120	120	120	120
0.6	0.6	0.6	0.6	0.6	0.6	0.6
0	0	0	0	0	0	0
https://github.cc https://github.cc https://github.cc https://github.cc https://github.cc https://github.cc https://github.cc						
50	50	50	50	50	50	50
0	0	0	0	0	0	0
0	0	0	0	0	0	0
https://github.cc https://github.cc https://github.cc https://github.cc https://github.cc https://github.cc https://github.cc						
180	200	200	200	200	200	200
0	0	0	0	0	0	0
0	0	0	0	0	0	0
0	0	0	0	0	0	0
https://github.cc https://github.cc https://github.cc https://github.cc https://github.cc https://github.cc https://github.cc						
66	66	66	59.4	66	66	66
1	1	1	1	0.9	1	1
0	0	0	0	0	0	0
https://github.cc https://github.cc https://github.cc https://github.cc https://github.cc https://github.cc https://github.cc						
100	100	100	100	100	90	100
200	200	200	200	200	200	180
100	100	100	100	100	100	100

1.6	1.6	1.6	1.6	1.5	1.6	1.6
351.6	351.6	351.6	345	351.6	341.6	351.6
595	615	615	608.4	615	610	607
0	0	0	0	0	0	0
0	0	0	0	0	0	0
8400	8400	8400	8400	8400	8400	8400
0	0	0	0	0	0	0
2.295019262	2.288765974	2.288765974	2.330678949	2.289639382	2.351228797	2.291263195
55.08046228	54.93038337	54.93038337	55.93629478	54.95134516	56.42949113	54.99031669
0.27%	0.00%	0.00%	1.83%	0.04%	2.73%	0.11%
SensorOn	SensorIdle	SensorOff	DisplayOn	DisplayOff	RadioStandby	RadioTX

	Profiles (usage	0
	0	0
	"off"	"sensing"
	0	0
198	0%	20%
120	0%	80%
0.6	100%	0%
0	0	0
https://github.com/Jingyii800/Hydration-Companion/blob/main/data_sheets/149	0	0
50	0%	100%
0	0	0
0	0	0
https://github.com/Jingyii800/Hydration-Companion/blob/main/data_sheets/Step	0	0
200	0%	0%
0	0%	0%
0	100%	0%
0	0	0
https://github.com/Jingyii800/Hydration-Companion/blob/main/data_sheets/SSC	0	0
66	0%	100%
1	100%	0%
0	0	0
https://github.com/Jingyii800/Hydration-Companion/blob/main/data_sheets/espresso	0	0
100	0%	100%
200	0%	0%
90	0%	0%
	0	0
	14	9.5
	0	0
	0	0
	0	0
	0	0

[illegible]

0	0
0	0
"interactive"	0
0	0
50%	0
50%	0
0%	0
0	0
0	0
100%	0
0	0
0	0
0	0
100%	0
0%	0
0%	0
0	0
0	0
100%	0
0%	0
0	0
0	0
50%	0
40%	0
10%	0
0	0
0.5 hours/day typical usage	
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