Make a decision using AHP

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Decision Objective:

Choose the best microcontroller for our program.

criteria:

1. **Ease of Use:** How straightforward it is to program and integrate.
2. **Processing Power:** Ability to handle real-time light comparison and motor control.
3. **Power Consumption:** Efficiency, especially if battery power is used.
4. **Cost:** Overall affordability within the project budget.

Alternatives:

Arduino Nano Every
ESP32
Raspberry Pi Pico
STM32 Blue Pill

Decision Matrix

Criteria	Weight	Arduino Nano Every	ESP32	Raspberry Pi Pico	STM32 Blue Pill
Ease of Use	0.3	5	3	4	2
Processing Power	0.25	3	5	4	4
Power Consumption	0.25	4	3	4	5
Cost	0.2	5	3	5	4
Total Score		**4.3**	**3.65**	**4.4**	**3.8**

Using AHP

A. Set Up Pairwise Comparison Matrix for Criteria

Criteria	Ease of Use	Processing Power	Power Consumption	Cost
Ease of Use	1	3	5	2
Processing Power	1/3	1	2	1/2

Power Consumption	1/5	1/2	1	1/3
Cost	1/2	2	3	1

B. Normalize Pairwise Comparison Matrix

Criteria	Ease of Use	Processing Power	Power Consumption	Cost	Average Weight
Ease of Use	0.57	0.6	0.56	0.53	0.565
Processing Power	0.19	0.2	0.22	0.13	0.185
Power Consumption	0.11	0.1	0.11	0.09	0.102
Cost	0.14	0.1	0.11	0.27	0.155

C. Score Each Alternative by Each Criterion

1. Usability (Weight: 0.565)

Ease of Use	Arduino Nano Every	ESP32	Raspberry Pi Pico	STM32 Blue Pill	Weight
Arduino Nano Every	1	3	2	5	0.47
ESP32	1/3	1	1/2	3	0.20
Raspberry Pi Pico	1/2	2	1	4	0.27
STM32 Blue Pill	1/5	1/3	1/4	1	0.06

2. Processing Power (Weight: 0.185)

Processing Power	Arduino Nano Every	ESP32	Raspberry Pi Pico	STM32 Blue Pill	Normalized Weight
Arduino Nano Every	1	1/3	1/2	1/2	0.15
ESP32	3	1	2	1	0.18

Raspberry Pi Pico	2	1/2	1	1/2	0.15
STM32 Blue Pill	2	1	2	1	0.18

3. Power Consumption (Weight: 0.102)

Power Consumption	Arduino Nano Every	ESP32	Raspberry Pi Pico	STM32 Blue Pill	Normalized Weight
Arduino Nano Every	1	2	1	1/2	0.08
ESP32	1/2	1	1/2	1/3	0.07
Raspberry Pi Pico	1	2	1	1/2	0.1
STM32 Blue Pill	2	3	2	1	0.1

4. Cost (Weight: 0.155)

Cost	Arduino Nano Every	ESP32	Raspberry Pi Pico	STM32 Blue Pill	Normalized Weight
Arduino Nano Every	1	2	1	1/2	0.12
ESP32	1/2	1	1/2	1/3	0.09
Raspberry Pi Pico	1	2	1	1/2	0.15
STM32 Blue Pill	2	3	2	1	0.06

D. Final Scores

Microcontroller	Ease of Use (0.565)	Processing Power (0.185)	Power Consumption (0.102)	Cost (0.155)	Total Score
Arduino Nano Every	0.47	0.15	0.08	0.12	**0.82**
ESP32	0.2	0.18	0.07	0.09	**0.54**
Raspberry Pi Pico	0.27	0.15	0.1	0.15	**0.67**
STM32 Blue Pill	0.06	0.18	0.1	0.06	**0.4**

We can note that the results obtained by AHP are similar to those obtained by our Design Matrix. Arduino Nano Every is preferred.