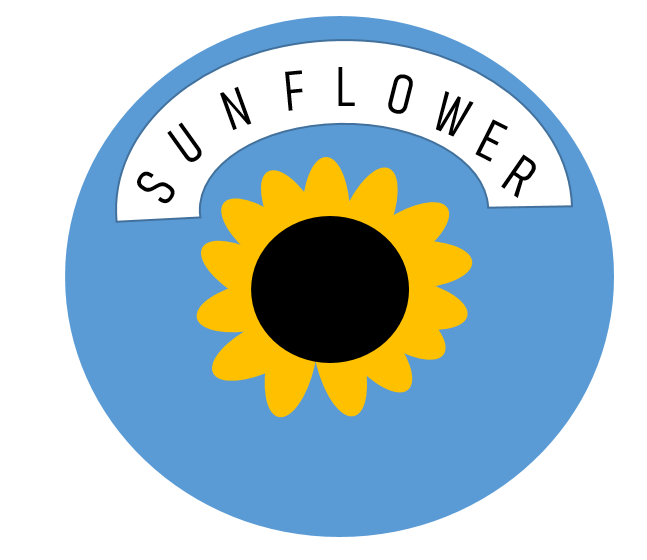
**PA RASPBERRY PI COMPETITION 2022**

**SCHOOLS, COLLEGES AND CUBS SUBMISSION FORM**

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| --- | --- |
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| SCHOOL/COLLEGE/CLUB NAME | Fulford School |
| TEAM NAME | Fulford STEM Club |
| CATEGORY  *(please circle)* | Category 1: Years 5-6  Category 2: Years 7-9  Category 3: Years 10-11  Category 4: Years 11-12 |

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| SUMMARY  500 word summary of your project | We are students at Fulford School, and we believe all people should have easy, eco-friendly access to electricity. We all need food to eat. But there’s a big problem in developing countries for farmers who grow crops to eat. If they don’t have a reliable electricity supply they can’t power their tools or water their crops. Some farmers have set up solar panels which power an irrigation system so that they can water their crops but the solar panels are fixed in one direction whilst the sun constantly moves through the sky all day.  We have come up with a solution: the Sunflower. The Sunflower has servos rotating the solar panel around in any direction to get as much sunlight possible: it will follow the sun across the sky until the night and then reset. This is a better option than getting your usual solar panel that faces only one direction because it will collect more light. This means it could receive more light to power the farmer’s house and tools through the night. This could also be a big money boost for farmers because the number of crops that survive increase because there won’t be as many crops dying from dehydration. Other examples could be people who can’t pay for or don’t have access to electricity. The Sunflower is a cheap and eco-friendly solution to those people.  R[esearch shows](https://www.alternative-energy-tutorials.com/solar-power/solar-panel-orientation.html) that making a solar panel move to face always face the sun increases the amount of electricity it generates by up to 38% which could make a life changing difference to farmers in developing countries who use that electricity to irrigate their crops to feed their families. Our pico powered solution is low cost and we want to extend the code so that it works anywhere in the world. |
| PROOF OF WORKING  This should be photos and a video to show your entry working. *(Attach photos here, and videos separately to your email. Please note that we encourage teams to use video footage as proof or working. Videos can be shared on private links for confidentiality and security).* | Here’s the 3d model that we built as our first prototype:    Next we mounted the actual solar panel on a servo camera mount and attached it to a stand:    Here’s our video explaining the project:  <https://youtu.be/xG_3uF4tHAk> |
| SOFTWARE & HARDWARE  Materials you used to get your project working. Must be within £100 (see rules) | |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | | micro servo | 40x28 solar panel | micro servo camera | raspberry pi pico explorer base | raspberry pi pico explorer board | Jumper leads | Total | | £3.00 | £34.73 | £22.68 | £16.66 | £3.46 | £3 | £83.53 | | Inserting image... [place to get it](https://thepihut.com/products/dc-motor-in-micro-servo-body?variant=27740229201&currency=GBP&utm_medium=product_sync&utm_source=google&utm_content=sag_organic&utm_campaign=sag_organic) | Inserting image...[place to get it](https://www.ebay.co.uk/itm/234324335969?chn=ps&mkevt=1&mkcid=28) | [place to get it](https://www.ebay.co.uk/itm/403185802730?chn=ps&mkevt=1&mkcid=28) | [place to get it](https://www.googleadservices.com/pagead/aclk?sa=L&ai=CSTHGOwUyYuPqBsrgtgfKx5DwCvPZxJdmsuaVzf4HgsPfhMcICAQQASDezc8eKB1gu57Gg9AKoAGlsYbmA8gBB6kC0NjALr3ntT6qBGxP0JCuGF_3RN0aOq824agTgdboHs4YPEx3olQda9FjLRWeWRPyWycJdn_SKttmCogVHaF7Z07XSBQmoWxxP-JXSlLYnMLE4v-8wWTQV8TnphRtW3EYuxBKXqj-7MBM7j26n9Z9d4MTh7oe1U_ABJX4hPLXAYgF_YWF7gXABQWgBiaAB8PO-RmQBwOoB6a-G6gHuZqxAqgH89EbqAfu0huoB_-csQKoB8rcG6AIor09sAgBwAgB0ggQEAEgBDICgEA6BoCAgICAEJoJOGh0dHBzOi8vY29vbGNvbXBvbmVudHMuY28udWsvcHJvZHVjdHMvcGljby1leHBsb3Jlci1iYXNlsQnNdq4XH0dfCLkJzXauFx9HXwj4CQGYCwHQCyW4DAHoDA3gEs3IjpPY3qeKjwGCFAQIARIA0BUB6RUx-GaxEzWih_AV6_nFBfoVJ3Nob3BpZnlfR0JfNjUzOTc5ODQ3ODkwOV8zOTI1NDUxNjU5Njc5N4EWVUn3cWeTEEeIFuG4ILgWoOz4B8AW4M7kCuoWBAi28iD4FgGAFwGSFwkSBwgBEAMY9gI&ctype=5&ved=0ahUKEwiKgb-C_Mr2AhWLYcAKHWt5C8cQww8I6wc&dblrd=1&val=Ggg93ra0fFXQySABKAAwoPqMgc7zoJEnOLKDyJEGQMKLyJEG&sig=AOD64_3M_tbonjwbZWcknAd19y8qEHVVBA&adurl=https://coolcomponents.co.uk/products/pico-explorer-base%3Fcurrency%3DGBP%26variant%3D39254516596797%26utm_medium%3Dcpc%26utm_source%3Dgoogle%26utm_campaign%3DGoogle%2520Shopping)[place to get it](https://shop.pimoroni.com/products/pico-explorer-base?variant=32369514315859) | Inserting image...[place to get it](https://www.rapidonline.com/Raspberry-Pi-Pico-RP2040-Microcontroller-Board-75-1132?IncVat=1&utm_source=google&utm_medium=surfaces&utm_campaign=shopping%20feed&utm_content=surfaces%20across%20google) | [Place to get it](https://shop.pimoroni.com/products/jumper-jerky-junior?variant=1076482173) | yay its under £100 | |
| SOURCE CODE  For the new software you created | Code is written in micropython for the raspberry pi pico:  We used Thonny  <https://github.com/pddring/pico/blob/main/micropython/sunflower.py>  At the moment we’ve written the code to move the servos which will move the solar panel manually when you press the buttons. This is enough to test our prototype. We've made it so that the solar panel will turn to face the sun throughout the day but we haven't yet made it calculate the sun rise / sun set based on the location. We've ordered a GPS sensor which will allow us to set the time and calculate all the angles anywhere in the world but we haven't written the code to use it yet. We’ve done the hard part! |
| INSTRUCTIONS  Provide written instructions explaining how your project could be recreated using this software, hardware, and code. | 1. Buy all the components. This includes the raspberry pi Pico, the explorer board, the servo, and the solar panel. 2. Assemble the servos into the camera mount and stick the solar panel onto it. 3. Connect the computer to the Pico with a USB cable while holding the bootsel button on the Pico down. This will make your computer see the pico as though it is a USB drive. 4. download the pimoroni firmware from <https://github.com/pimoroni/pimoroni-pico/releases/download/v1.18.0/pimoroni-pico-v1.18.0-micropython-v1.18.uf2> the first time you use it. 5. Copy the UF2 file into the pico folder (from step 3) 6. Open the source code from <https://github.com/pddring/pico/blob/main/micropython/sunflower.py> in thonny. Make sure you change the mode to MicroPython (Raspberry Pi Pico) at the bottom of the screen      1. Press run   For the hardware, you’ll need to connect both servos to the raspberry pi pico.  The servos have three wires: red (power), brown (0v) and orange (signal).  We connected some male to male jumper leads to each of the servo motors. It really helps if you use the same colour cables but it’s not essential as long as you keep track of what’s connected to what:    The orange cable from one servo needs to go to pin GP0 on the pico explorer and the orange cable from the other servo needs to go to pin GP1  The red cable from both servos needs connecting to 3v3 power and the brown cable from both servos needs connecting to ground (0v):    We found it helpful to use the breadboard to connect more than one thing to power or ground as shown below.    When you run the code, you should be able to move on servo with the A and B buttons and the other servo with the X and Y buttons: |