

Welcome to the U3A 2019 Challenge Event.

Please take a look at the following contents before designing a robot or attending a challenge event.

Contents

INTRODUCTION.....	1
THE RULES.....	2
SAFETY RECOMMENDATIONS.....	3
THE CHALLENGES.....	5
HAVE A GO.....	7
WORKSHOPS FOR LEARNING (SEMINARS & TALKS).....	7
THE VENUE 2019.....	8
INTEREST QUESTIONNAIRE.....	8
CONTACTS:.....	9
RASPBERRY PI LINKS TO TUTORIALS.....	9
ARDUINO LINKS.....	9
PICAXE LINKS.....	9

INTRODUCTION

1. Any U3A group may enter at least one, or more, suitable constructions for the challenges devised for the event. Teams are encouraged to attend. There may be subsequent events if sufficient interest is shown.
2. The intention of the challenges is for U3A teams to submit constructions capable of moving by manual remote control and/or by self-contained guidance systems, and to be capable of applying adaptations to suit the challenges in the two categories as follows:
 - a. Category (A) challenges, simple devices, manually remote controlled (but may include devices used in Category (B)).
 - b. Category (B) challenges, autonomously controlled, using programmable devices** and sensors.
 - i. Category (B) challenges may be a future event unless significant interest is shown in the INTEREST QUESTIONNAIRE [Page 8](#) below.

THE RULES

1. The challenges will take place within contained arenas. The size of the arenas will differ according to the individual challenge requirements. Exact details will be given in the Challenges section.
2. The “robot” constructions may be of any design, wheeled, tracked or walkers, using any platform, providing they comply with the following and are not significantly changed**** across all the year’s events:
 - a. Footprint of platform not to exceed 200mm x 300mm max including wheels, tracks or curtain.
 - b. Any attachments for the challenges may have restrictions on the size. Please refer to the challenges detail document to be sure.
 - c. Constructions must be battery powered ***, but must not exceed 30V.
 - d. Intentional smoke or flames are not permitted (smoke alarms).
 - e. Pyrotechnics of any kind are not permitted.
 - f. Use of compressed gasses for drive or projectiles are not permitted.
 - g. If Nerf© type or similar projectiles are used, they must have soft rubber ends, and must not cause injury to nearby spectators.
 - h. Flying devices (drones) are not permitted. Hovercraft devices are permitted.
 - i. Constructions must be wireless remote controlled without being tethered by wiring or any other means.
 - j. There is no height limit to the constructions.
3. Except for challenges and testing under controlled conditions in the presence of safety stewards, electrical systems must be powered down, or constructions stored on stands or blocks to avoid accidental collisions, injury or damage.
4. The radio remote control must be a legally permitted licence free system in the UK, providing:
 - a. It does not interfere with any other contestant’s radio system.

- b. Use of standard 27Mhz, 35Mhz and 40Mhz radio systems which require crystal frequency control are not encouraged, as they are most likely to cause interference to other robots using the same system.
 - c. Use of dynamic channel allocation (binding or pairing) systems, usually 2.4Ghz are encouraged, to avoid interference.
 - d. The use of WiFi or Bluetooth control devices are permitted.
 - e. PS3/4, Xbox handsets, Mobile phone, Tablet, Laptop or any other microcontroller controller may be used to provide remote control of the robot (see rule 2i).
5. Table top facilities for repairing constructions (supervised and restricted access) will be supplied for contestants, with access to mains power. Please refer to safety recommendations with this facility.

Notes:

** Programmable devices can include Raspberry Pi©, Arduino©, Picaxe©, Adafruit© or similar intelligent devices with appropriate sensors to provide control, or adaptations for completing the challenges.

*** Please see the safety recommendations section with Lithium types of batteries and charging.

**** Significant changes would be changing the chassis or motor transmission system. Changing wheels to tracks or vice versa, or to different wheel types is permitted as long as connecting to the original axle arrangement.

This applies to each one year of contests only. Redesigns or major modifications can be made for each successive year of contests.

SAFETY RECOMMENDATIONS

Batteries.

Fusing. Ideally all battery systems should be fault protected by fusing or other means to avoid any risk of overheating. There must be an accessible way to turn off the power in any fault event by means of a battery isolation switch.

Type. Liquid (wet) electrolyte types of battery are not permitted. Other rechargeable, gel, or single use types are permitted.

Charging. An appropriate charger should be used, which will not allow the maximum battery voltage or charge current to be exceeded. (or bring spare charged batteries).

Lithium batteries (including spares) should be charged and stored in a fireproof bag if not inserted in the robot, and may use typically as follows:

From Amazon for £2.70 inc p&p, or similar:

https://www.amazon.co.uk/TOOGOO-Battery-Safety-Fireproof-Silver/dp/B00UBOPJLK/ref=sr_1_34?ie=UTF8&qid=1543856317&sr=8-34&keywords=fireproof+pouches+for+lipo+batteries

Or from Ebay for £3.75 inc p&p.

<https://www.ebay.co.uk/itm/Fireproof-Bag-Waterproof-Money-File-Box-Holder-For-Store-Important-Document-ZX/312323788943?hash=item48b7f2d08f:m:ma8lzclKTAmcxlu-HBhcQ2A:rk:16:pf:0>

IMPORTANT:

Batteries on charge should not be left unattended.

Soldering.

If repairs should be necessary, an electrical soldering iron will be available. No gas types or flames will be permitted. The soldering iron stand should be used to store the iron. Care should be taken not to allow a hot soldering to contact any surface or material not intended to be soldered.

The soldering iron must **not be left unattended** when powered or hot.

Projectiles.

For some challenges, it may be required to knock down skittles or other objects in the arena. The robot may control the ejection of a soft projectile such as in small Nerf© guns, or small soft rubber balls. The ejection mechanism must be electro-mechanical in nature. It may not use any kind of pressurised gas.

Scrutineering

All the above Safety Recommendations will be scrutineered by stewards for compliance. Constructions may be rejected if deemed unsafe.

Scrutineers may also comment on compliance with the robot construction rules listed above.

Spectators

Spectators are welcome to attend the event to cheer on the teams, but entry may be restricted by the venue regulations.

Children below 12 years old must be supervised by an adult. Spectators must not enter arena areas, nor the repair workshop area.

If you wish to bring children or grandchildren to the event, please check first by using the appropriate venue contact email address below, in case the venue or U3A has restrictions.

THE CHALLENGES

The challenges will take place in the afternoon of the allocated day in the programme.

CATEGORY (A) CHALLENGES (manual remote control)

A1. U3A's Crazy Golf

- a. Move a golf ball around the course and into the 18th hole!

A2. Skittles Challenge firing projectiles

- a. A number of hinged targets to be knocked down by small fired projectiles or balls. Uses soft rubber parts.

A3. Driving Obstacle Course Challenge

- a. Robot driving course to include a reverse park into a bay, three point turn, negotiating obstacles, and other skills.

A4. Final Challenge for 2 robots: Figure of 8 Mayhem Dash

- a. Timed event, winner completes a fixed number of complete figures of eight laps without intervention in the shortest time. Protection may be required if knocked off course or rolled.

The following challenges may be substituted or in a subsequent event:

- A5. Jenga© block tumble with 2 robots**
 - a. Robots have extending push rods to remove one block at a time.
 - b. Runner up tumbles the pile.
- A6. Obstacle Course Challenge**
 - a. Negotiate rocks, ramps and paper
- A7. Noughts and crosses with 2 robots**
 - a. Two robots with moveable marker pen to mark squares in turn on paper grid.
- A8. Simple Maze Driving Challenge**
 - a. Walled driving challenge
- A9. Flipper golf Challenge**
 - a. Use a swinging club to push a golf ball into the nominated holes.
- A10. The Sumo Push Challenge**
 - a. Front and rear bumpers able to push another robot behind the enemy line.

CATEGORY (B) CHALLENGES (autonomous guidance) – Typical ideas

- B1. Follow the White Line Challenge**
 - a. Autonomous navigation of a line on the arena floor.
- B2. Colour Recognition & Sequence Challenge**
 - a. Four colours to be identified and visited in sequence autonomously to gain points.
- B3. Maze Challenge**
 - a. Autonomous driving course to find the exit.
- B4. Speed Challenge**
 - a. Fastest around course autonomously wins top points.

NOTE: PLEASE SEE THE “ChallengeDetails.docx” FOR MORE DETAILS.

JUDGING THE CHALLENGES

Judging challenges will be conducted by independent referees who are not connected with participating U3A's.

Points will be awarded for each challenge. The highest total points will be the day's winner, and total points will be carried forward to the next event (if applicable) to establish the Year Winner.

HAVE A GO

Participants to the Science Network meeting are invited to have a try at one of the challenges with a willing robot! Then come back with your own next year.

WORKSHOPS FOR LEARNING (SEMINARS & TALKS)

There may be talks and seminars available for any U3A member to attend on the same day but prior to the Challenge event. If there is sufficient interest for talks and practical sessions, then please contact us via the details below to state which area would interest you.

Typically these talks may cover the following areas in the morning:

- State of the Art robotics.
 - Given by Active Engineering, Aston university

More practical areas could include:

- Programmable devices introduction
 - Raspberry Pi, Arduino, Picaxe
- 3D printing of parts
- Motors and drives
- Wireless control systems

Please let us know by contact email if you have any suggestions.

THE VENUE 2019

Event: Constructor's Challenge, or U3A Science Network annual event
Venue: Staffordshire, TBA
Date: October 2019
Entry: TBA

INTEREST QUESTIONNAIRE

If this proposal seems interesting to you or any in your U3A, we would be grateful for an email reply to the following questions:

1. Would your preference be for a complete robot build from scratch, or use of an existing motorised platform, then enhanced to provide the challenge adaptations?
2. Would you be able to include a programmable device for controlling challenge adaptations, or for it to provide motion control?
3. Would you like to see "autonomous" challenges included in the programme for 2019, by providing an entry robot?

Thank you if you could send any reply or comments/ideas to cannockchaseu3a@gmail.com

This will enable us to gauge the interest in types of challenges.

CONTACTS:

Construction Entry questions:

Barry James, email: cannockchaseu3a@gmail.com

Programmable devices, sensors, wireless and coding questions:

Ernie Prevost, email:

ernie@prevost.me.uk

Venue or Science Network questions:

Michaela Moody, email:

michaelamoody2015@gmail.com

RASPBERRY PI LINKS TO TUTORIALS

Help getting started

<https://www.raspberrypi.org/help/>

Projects for robots

<https://projects.raspberrypi.org/en/projects?interests%5B%5D=robotics&software%5B%5D=python>

Tutorials

<https://tutorials-raspberrypi.com>

ARDUINO LINKS

Arduino home

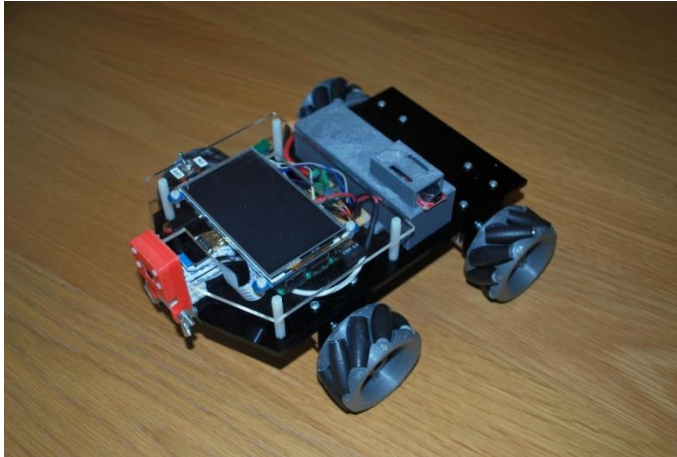
<https://www.arduino.cc>

PICAXE LINKS

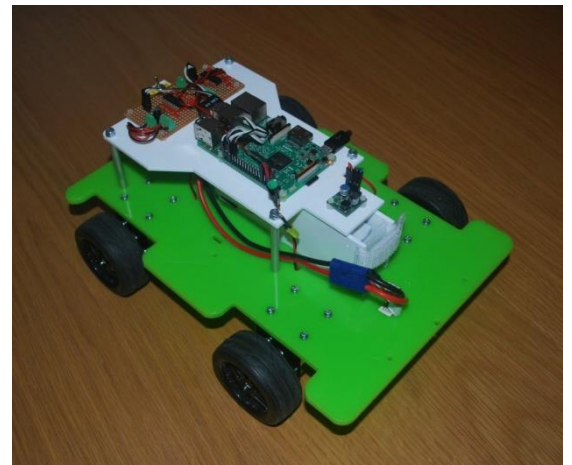
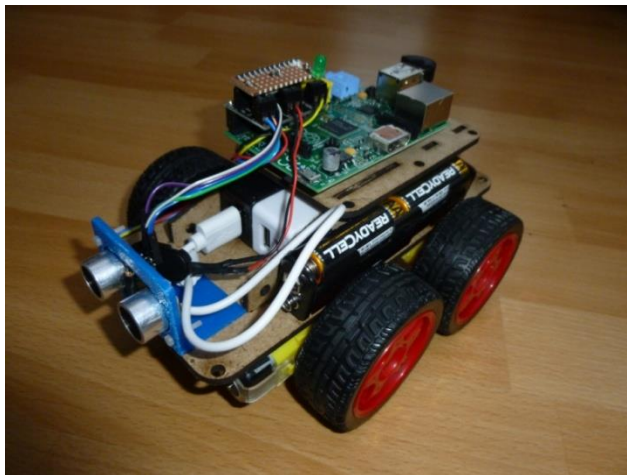
Introduction

<http://www.picaxe.com/What-Is-PICAXE>

Some examples of typical constructions by a U3A member:



Robots using a “Raspberry Pi” for sensor control and mecanum wheels capable of moving sideways.



Document: TheRulesRevJ.docx
DRAFT, January 2019
Barry James, ©Cannock Chase U3A Science & Technology group.