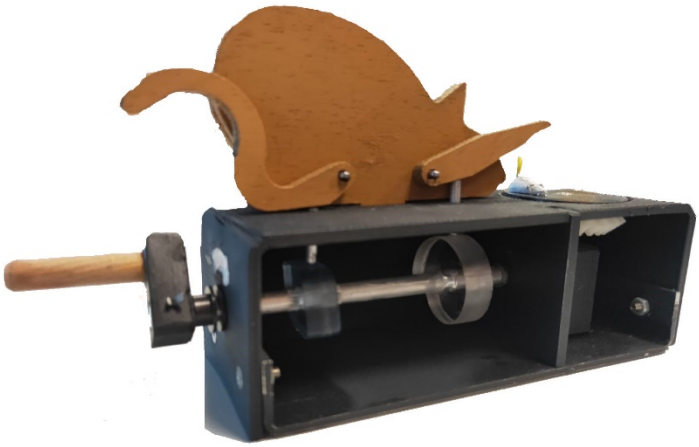
Toy Design Competition 2019

Automata Category

1. Introduction

This competition is an exciting activity that provides a platform for students to challenge their creativity and skills in designing fascinating animated mechanical toy sculptures called Automata.



Automata are originated from the Cabaret Mechanical Theatre (CMT), a highly acclaimed travelling exhibition originated from the UK that combines the work of Arts, Science and Technology. Nearly all of the work in the CMT collection is humorous. These mechanical toy sculptures showcase the fine art of engineering and are valued highly in the collectors' circle. They can be brought to life by cranking a handle to move a shaft mounted with a series of machine parts such as cams, gears, linkages, belts and pulleys, ratchets, etc. which are in turn connected to the various parts of the sculptures to produce the desired movement.

This Toy Design Competition 2019 is organised by the Singapore Polytechnic's School of Mechanical and Aeronautical Engineering.

2. Competition Rules

2.1 The theme of this year's Automata Design Category is "**Singapore – Progressing Forward**".

2.2 Participants are required to create interesting Automata to show the progress of Singapore since her birth as a Nation till now. They can design their automata to recall past fond memories of our nation, and showing the achievements of Singapore's national development, such as the change in landscape of our city's waterfront as well as housing estates. The Automata can also depict the vibrancy and harmony of our multi-racial community, such as our people's involvement in sports, cultural and other recreational activities.

2.3 Participants shall use the appropriate mechanisms, such as gears, cams and linkages, etc. to drive their automata in order to deliver their respective interesting and memorable stories.

2.4 The competition is open to all Secondary School students in Singapore.

2.5 The number of students in each team should not be more than four.

2.6 Each individual or team shall submit only one entry.

2.7 The size of each Automaton should not exceed **45 cm (Length) x 35 cm (Width) x 40 cm (Height)**.

2.8 Participants may design and draw their Automata assemblies and parts manually or using any CAD software. However, the use of CAD software will help them to design, size, dimension and animate their automata movements more effectively before they start to fabricate it.

2.9 A Special Award will be presented to the team that can use any CAD Software to design and generate their Automaton with best virtual animation effect.

3. Design Guidelines

3.1 Participants should first visit various Automata websites, such as the http://www.cabaret.co.uk/, http://automata.co.uk/ and http://www.flying-pig.co.uk/ websites before embarking on their own design. They should also visit various Design and Technology websites, such as the http://www.technologystudent.com/ (click "MECHANISMS" and "GEARS AND PULLEYS") to learn how Automata parts can be animated by gears, timing belt and pulley drives, cams, linkage mechanisms, ratchet mechanisms, crank and crank shafts, etc.

3.2 Participants are required to build their Automata using materials such as plywood, chipboard, softwood (balsa), wood, ball/ cube/dowel, basswood sheet/strip, ice cream stick, plastic, high density foam, kapaline board, etc. They can also use 3D Printer and 2D Laser Cutting Machine to create their Automata parts.

3.3 Participants should use a Ø10 mm steel rod or Ø12 mm wooden rod as the main cranking shaft and driving shaft(s) of other critical Automata parts so as to minimize shaft deflection and power transmission losses which will result in malfunctions of moving parts.

3.4 The Automaton crank should be installed on the right-hand side and the direction of cranking should be indicated on the same side. Clockwise direction of cranking is preferred.

3.5 Parts may be joined together by adhesive (glue), nails, self-tapping screws or dowels. Pins may be used to create joints. Strings, wires, standard gears, belts and pulleys, etc., can be used to create the movements of the Automata.

3.6 Compression, extension and torsion springs of appropriate size and stiffness (about Ø0.5 mm wire diameter) should be connected to cam followers, cranks and linkages, etc. to create the return or oscillating movements of moving Automata parts.

3.7 Participants should source for the above mentioned materials and standard parts before sizing their Automata. These materials and standard parts can be purchased from shops, such as Art Friends, Daiso and hobby shops.

4. Competition Details & Prizes

4.1 The submitted entries will be judged and ranked by a panel of judges formed by the organising committee.

4.2 The prizes are:

1st Prize	$500 Cash Voucher + Trophy for School
2nd Prize	$350 Cash Voucher + Trophy for School
3rd Prize	$200 Cash Voucher + Trophy for School
5 Merit Prizes	$100 Cash Voucher each

Special Design Award for team with best virtual animation effect using any CAD software ($100 Cash Voucher). Animation file must be in mp4 or avi format.

Commendation Awards for all deserving entries ($50 Cash Voucher).

4.3 All winning students will be presented with certificates.

5. Judging Criteria

5.1	Design Description	10%
5.2	Poster Design (A2 size .ppt template)	10%
5.3	Functionality	20%
5.4	Model Quality	20%
5.5	Originality and Creativity	40%

6. Registration & Final Submission

6.1 Participants are to register their interest to their teacher I/C. The teacher I/C shall collate and submit to the Organising Committee using the registration form available at https://www-sp-edu-sg-admin.cwp.sg/engineering-cluster/mae/life-@mae/toy-design-competition/2019

6.2 Closing date of registration is **2nd April 2019.**

6.3 Participants should submit their entries through their teacher I/C to the Organising Committee by **1st July 2019** for judging.

6.4 Each submitted entry must include:

- The physical model of the Automaton.
- A hardcopy of your poster in A4 size (please see poster information below).
- The softcopy of the following through download link (eg. Google drive, dropbox, wetransfer etc.):
    - One A2-size poster based on the template which will be emailed to the teacher-in-charge or download from the website. The poster shall include:

- The name of the Automaton.
- A group photo of the participating team with students' full names (from left to right) and the name of the teacher and school below it.
- A short write-up of the Automaton with not more than 100 words. The write-up shall include its storyline, how each of the movements is being actuated by the various mechanisms.
- Either a scanned image of the manually drawn pictorial sketches or 3D rendered or shaded image of the design (if CAD software is used).

6.5 Teachers can store and submit all their students' entries in a CD or through a download link if there are many entries to be submitted. Submission entries must have the Automaton Title and Name of School clearly labelled on the CD or files.

6.6 All works submitted should be original and should not have been awarded by the organiser of another similar competition before.

6.7 All participants are responsible in ensuring their submission will not infringe existing copyright/patent law.

6.8 The Organising Committee or sponsor is not liable for infringement or abuse of any design as a result of entry in this competition or as a result of subsequent publicity.

6.9 Entries that do not meet the competition rules will be disqualified.

7. Announcement of Results

7.1 The winners and their ranking will be announced during the Toy Design Competition 2019 Prize Presentation Ceremony to be held in the Singapore Polytechnic Auditorium **end of July 2019 (to be announced later)**.

7.2 In the event of a tie, the organising committee reserves the right to redistribute the prizes.

7.3 All decisions made by the judging panel are final.

For more information and registration, please contact:

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