

Kontes Robot ABU Indonesia 2019 KRAI - 2019

**Menuju
ABU ROBOCON 2019
Ulaanbaatar – Mongolia**



**Direktorat Kemahasiswaan
Direktorat Jenderal Pembelajaran dan Kemahasiswaan
Kementerian Riset, Teknologi dan Pendidikan Tinggi
Jakarta**

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Latar Belakang

Kontes Robot Indonesia (KRI) telah mulai dilaksanakan sejak tahun 1993, oleh Politeknik Elektronika Negeri Surabaya (PENS) secara lokal dengan mengundang sejumlah peserta dari Perguruan tinggi Negeri maupun Swasta di Indonesia, dengan mengadopsi aturan pertandingan saat itu dari NHK ROBOCON di Jepang. Pemenang kontes robot ini dikirim untuk bertanding di NHK-Robocon –Jepang dibantu dengan dana kerjasama Indonesia-Jepang, (Jaica), Tim Robot dari Indonesia waktu itu, yang diwakilkan oleh tim robot dari PENS, menjadi satu-satunya tim robot dari luar Jepang yang mengikuti kontes NHK_Robocon ini.

Pada tahun 2001, Direktorat jenderal pendidikan tinggi mengambil inisiatif untuk mendanai kontes robot ini sebagai salah satu ajang kompetisi kreativitas mahasiswa perguruan tinggi di Indonesia, dan dimulailah Kontes Robot Indonesia yang pertama (KRI 1) secara resmi didanai DitJenDIKTI (saat itu) melalui program Penelitian dan Pengabdian kepada masyarakat (P2M-DIKTI). Kontes ini dilaksanakan di PENS Surabaya, diikuti sekitar 23 tim dari berbagai perguruan tinggi di Indonesia. Tim Robot *Becak* dari PENS sebagai pemenang KRI 1 dikirim untuk mewakili negara Indonesia ke Jepang, dan berhasil mendapatkan Juara Pertama dalam kontes robot NHK-Robocon di FUKUSIMA – Jepang. Dan sejak tahun 2002, NHK Robocon diubah menjadi ABU Robocon yang disponsori oleh Asian Broadcasting Union (ABU) sebagai organisasi penyiaran program Televisi yang memiliki lebih dari seratus anggota stasiun televisi dari berbagai negara di dunia. Dalam hal ini Indonesia diwakili oleh Televisi Republik Indonesia (TVRI) sebagai anggota. Pertandingan ABU Robocon yang pertama dilaksanakan pada tahun 2002 di Tokyo-Jepang.

Sejak Tahun 2001 dan seterusnya, Kontes Robot Indonesia (KRI) diadakan setiap tahun sekali, dengan mengambil Tema yang sesuai dengan Tema yang digunakan dalam ABU Robocon agar Tim dari Indonesia dapat menjadi salah satu peserta yang mewakili negara Indonesia. Sehubungan dengan ABU sebagai sponsor utama acara ABU Robocon, maka di Indonesia harus diwakili oleh TVRI sebagai Televisi anggota ABU yang mewakili negara Indonesia ini. Sehingga dalam hal ini TVRI bekerjasama dengan Dikti untuk memfasilitasi keikutsertaan Tim Robot dari Indonesia agar dapat bertanding dalam kontes internasional ABU Robocon ini.

Tahun 2019 ini, Indonesia kembali akan mengikuti kontes robot tingkat Internasional ABU Robocon 2019 yang akan berlangsung di Ulaambaatar, Mongolia, pada tanggal 25 Agustus 2019, yang merupakan lomba yang kesembilan belas, dimana Tim Robot yang mewakili Indonesia akan berkompetisi dengan 20 tim Robot peserta dari negara-negara anggota Asia-Pacific Broadcasting Union (ABU) di seluruh dunia. Seleksi dan evaluasi tim robot yang akan mewakili Indonesia, dilakukan melalui kontes Robot ABU Indonesia (KRAI) yang dilaksanakan secara bertahap dalam bentuk kontes tingkat Regional dan tingkat Nasional.

KRAI dilaksanakan bekerjasama dengan Perguruan Tinggi yang ditunjuk untuk pelaksanaan Kontes tingkat regional dan Kontes tingkat Nasional. Tim yang mewakili Indonesia akan dipilih melalui seleksi dalam Kontes Robot ABU Indonesia 2019(KRAI-2019) yang akan diselenggarakan secara bertahap dimulai dengan Kontes Regional pada 4(empat) wilayah regional sesuai dengan jadwal yang telah ditentukan. Pemenang dari ke-empat Kontes Regional akan diundang untuk ikutserta dalam Kontes Nasional KRAI-2019.

Sebanyak dua puluh empat tim terbaik dari kontes regional, yang memenuhi persyaratan dan lolos seleksi, dapat berpartisipasi dalam kegiatan kontes Nasional KRAI-2019. Ketentuan pertandingan KRAI-2019 mengacu kepada aturan baku dari ABU Robocon 2019, dimana setiap tim terdiri dari 3 (tiga) orang mahasiswa dan 1 (satu) orang dosen pembimbing, yang akan merancang, membuat, mengoperasikan dan mengatur strategi robot manual atau robot otomatis yang akan digunakan.

Pemenang Juara pertama kontes Nasional KRAI-2019 akan mewakili Indonesia dalam ABU Robocon 2019 yang dilaksanakan pada tanggal 25 Agustus 2019 di Ulaanbataar, Mongolia.

Tema:

Tema untuk Kontes Robot ABU Indonesia (KRAI) 2019 adalah

“Sang URTUU Agung Menyebarkan Pengetahuan”

Tema ini diselaraskan dengan tema yang telah ditentukan oleh ABU Robocon 2019 yaitu

“GREAT URTUU: *Sharing the knowledge*”

Sistem Pertandingan

- Misi pada tema tahun 2019 ini adalah pengiriman informasi dengan cepat menggunakan Sistem URTUU.
- Kompetisi dilaksanakan antara Tim Merah dan Tim Biru dalam waktu 3 (tiga) menit.
- Setiap tim membuat satu buah robot manual dinamakan Messenger Robot 1 (MR1), dan satu buah robot otomatis dinamakan Messenger Robot 2 (MR2). Messenger Robot 2 memiliki empat buah kaki seperti kuda, dan tidak boleh menggunakan roda. Robot MR1 juga boleh semi-otomatis maupun full otomatis.
- Robot manual MR1 berangkat dari Start point yang disebut **Khangai_Urtuu**, sambil membawa plakat **Gerege** sebagai testimony, berjalan melalui Hutan, Jembatan dan melewati line1 disebelah zona Gobi-Urtuu
- Setelah MR1 tiba di **Gobi-Urtuu** yang merupakan start-point untuk MR2 menunggu, maka robot MR1 dapat memberikan **plakat Gerege** kepada robot MR2. Setelah berhasil menyerahkan plakat, MR1 boleh mengambil **Shagai** di **Khangai Area**. Penempatan Shagai didalam area itu ditentukan oleh tim peserta.
- Apabila robot MR2 berhasil menerima plakat Gerege, maka robot MR2 harus berjalan melalui Gobi-Area menggunakan empat kakinya, melewati **sand-dune** dan **Tussock** menuju ke **Mountain Urtuu**, selanjutnya robot MR2 harus menunggu di Mountain_Urtuu, sampai robot MR1 berhasil mengumpulkan nilai 50 points.
- Setelah robot MR2 berhasil masuk ke **Mountain Urtuu**, robot MR1 boleh mulai berjalan menuju **Throwing zone**, untuk melemparkan **Shagai** ke **Landing zone**, serta harus mengumpulkan score 50 point atau lebih.
- Setelah itu Robot MR2 diizinkan menaiki gunung, untuk mencapai **Uukhai_zone** dan mengangkat plakat Gerege keatas, kondisi ini disebut **“UUKHAI”**. Tim ini langsung dinyatakan sebagai pemenang.
- Robot MR1 berukuran maksimal 1000mm(L)x1000mm(W)x1000mm(H), dan selama dalam sesi pertandingan, robot boleh mengembang tapi ukuran tidak boleh melebihi 1500mm untuk ketiga sisinya.
- Robot MR2 berukuran minimal 400mm(L) x400mm(W) x400mm(H), dan selama dalam sesi pertandingan, robot boleh mengembang tapi ukurannya tidak boleh melebihi 800mm(W) x 1000mm(L) x 800mm(H).
- Berat total robot MR1 dan MR2 beserta kelengkapannya tidak boleh melebihi 50 kg.
- Batas tegangan catudaya tidak melebihi 24 V, pencatu tekanan pneumatik maksimal 600kPa.
- Lapangan berbentuk persegi empat dengan ukuran 10.000mm x 13.300mm, dikelilingi kayu setinggi 100mm dengan tebal 50mm, terbagi menjadi dua area untuk tim biru dan tim merah.
- Area untuk masing-masing tim terdiri dari beberapa zona, yaitu “Khangai-Urtuu”, “Khangai Area”, “Throwing Zone”, “Gobi Urtuu”, “Gobi Area”, “Landing Zone”, “Mountain Urtuu”, “Mountain Zone” dan “Uukhai Zone”.
- Dalam Khangai Zone, terdapat area hutan, jembatan, dan garis putih “Line1” sebagai panduan lintasan MR1. Dalam Gobi Area terdapat garis putih “Line2”, “Line3”, “sand dune” dan “Tussock”.
- Setiap tim terdiri dari tiga mahasiswa dan satu pembimbing, dengan maksimum tiga orang mekanik yang bertugas membantu di pit-stop dan set-up pada saat persiapan 60 detik diawal sesi.
- Pertandingan hanya berlangsung 3 (tiga) Menit, Sebelum pertandingan dimulai, tim diberikan waktu persiapan 60 detik, dalam waktu tersebut ketiga anggota mekanik diperbolehkan membantu mengangkat robot ke Arena pertandingan dan ikut mempersiapkan robot disisi arena.
- Apabila ada tim yang berhasil **“UUKHAI”**, maka tim tersebut dinyatakan sebagai pemenang, dan pertandingan dihentikan.
- Apabila tidak ada tim yang mencapai **“UUKHAI”**, dan waktu pertandingan 3(tiga) menit sudah habis, maka pertandingan dihentikan dan tim yang berhasil mengumpulkan Nilai tertinggi dinyatakan sebagai pemenang.
- Peraturan selengkapnya dapat dibaca pada lampiran B dari buku panduan ini.

Peserta

KRAI 2019 dapat diikuti tim mahasiswa dari institusi atau perguruan tinggi Negeri dan perguruan tinggi Swasta yang **terdaftar di Kemenristekdikti**. Setiap Tim calon peserta harus mengajukan proposal kepada panitia pusat KRI2019 dengan persetujuan Wakil Rektor/Ketua/Direktur Bidang Kemahasiswaan masing-masing Perguruan Tinggi. Borang Pendaftaran/proposal (*Application Form*) dapat dilihat pada lampiran A. Proposal merupakan Registrasi awal yang harus diajukan kepada Panitia KRI-2019.

Setiap tim calon peserta harus mendaftar dengan mengunggah softcopy proposal dalam format pdf secara on-line melalui alamat Website: <https://kontesrobotindonesia.id> dan juga wajib mengirimkan ke alamat email : harunnasrullah@gmail.com. Ukuran file softcopy maksimal 2(dua) Mbyte termasuk scan copy surat pengantar resmi dari pimpinan perguruan tinggi, dengan nama file/folder "**KRAI_NamaPT_NamaTim**". Calon peserta juga HARUS mengirimkan hardcopy 1(satu) set proposal ke alamat Dirmawa.

Pengiriman proposal softcopy dan hardcopy selambat-lambatnya sudah diterima di panitia **tanggal 22 Januari 2019**. Setiap Perguruan Tinggi **hanya diperkenankan untuk mengirim satu Tim peserta KRAI**. Semua proposal yang masuk ke sekretariat panitia akan dievaluasi oleh panitia.

Tahapan Evaluasi

Evaluasi dilakukan dalam beberapa tahap yaitu:

Evaluasi tahap pertama merupakan evaluasi administratif. Proposal yang diterima dan disetujui oleh panitia pusat akan diberitahukan kepada calon peserta melalui surat pemberitahuan ke alamat masing-masing dan melalui website Panitia pusat sesuai dengan jadwal yang sudah ditentukan.

Evaluasi tahap kedua dilakukan melalui laporan kemajuan dalam rekaman Video yang dibuat oleh peserta.

Kriteria evaluasi yang digunakan adalah :

- Kemajuan rancang bangun Mekanik Robot
- Sistem Kontrol Robot, Sensor dan Rangkaian Interface
- Strategi melakukan pelembaran bola-normal dan bola-emas
- Kemampuan Maksimal Robot sampai pada saat tahapan evaluasi ini.

Evaluasi tahap ketiga dilakukan melalui pertandingan KRAI tingkat regional yang akan dilaksanakan di empat tempat di masing-masing area Regional I, II, III dan IV.

Peserta yang lolos evaluasi tingkat regional dan mengikuti KRAI-2019 tingkat Nasional akan mendapatkan bantuan dana pembinaan pembuatan robot yang nilainya akan ditentukan kemudian, bantuan biaya transportasi kelas ekonomi dari perguruan tinggi ke tempat pelaksanaan KRAI Nasional serta akomodasi Tim, terdiri dari 3 (tiga) mahasiswa dan 1 (satu) dosen pembimbing, pembiayaan anggota mekanik tidak ditanggung. Khusus untuk tim peserta dari pulau Jawa, hanya diperkenankan menggunakan transportasi darat kelas ekonomi.

Penghargaan

Panitia menyediakan penghargaan bagi Tim Robot Juara Pertama, Juara Kedua, Juara Ketiga, Juara Harapan, Desain terbaik, Strategi terbaik dan penghargaan lain yang akan ditentukan oleh panitia kemudian.

Juara pertama kontes Nasional KRAI-2019 akan menerima piala bergilir Kontes Robot ABU Indonesia yang bernama **Sambhawana Pratimacala**. dan akan ditunjuk untuk mewakili Indonesia, dalam ABU Robocon 2019 yang akan dilaksanakan pada tanggal 25 Agustus 2019 di Ulaanbaatar, Mongolia

Waktu dan tempat Pelaksanaan :

KRI-2019 akan dilaksanakan dua tahap, Tahap pertama dilaksanakan pertandingan secara Regional dan tahap kedua dilaksanakan pertandingan tingkat Nasional. Pertandingan KRI 2019 tingkat Regional dilaksanakan bertempat di 4 (empat) kota untuk setiap wilayah regional dengan urutan jadwal sebagai berikut :

1. Tanggal 04-06 April 2019	Regional 3	-	-
2. Tanggal 11-13 April 2019	Regional 4	-	-
3. Tanggal 25-27 April 2019	Regional 1	-	-
4. Tanggal 02-04 Mei 2019	Regional 2	-	-

Tim-tim terbaik dari KRI tingkat Regional, akan diundang untuk mengikuti Pertandingan KRI tingkat Nasional yang akan dilaksanakan pada tanggal **19 - 23 Juni 2019** . Tim unggulan ini ditentukan sesuai dengan ketentuan dalam divisi masing-masing.

Tim peserta yang diundang untuk mengikuti Kontes Nasional KRI 2019 akan mendapat bantuan biaya pembinaan dan bantuan biaya transportasi kelas ekonomi dari lokasi Perguruan Tinggi ke lokasi Kontes Nasional.

Akomodasi peserta selama kontes regional akan disediakan oleh Panitia pelaksana kontes regional, sedangkan untuk peserta kontes nasional KRI-2019 akan disediakan oleh panitia kontes Nasional.

Jadwal Kegiatan Kontes Robot Indonesia 2019

No	Kegiatan	Tanggal *)	Tempat *)
1	Batas waktu Proposal Masuk	22 Januari 2019	Belmawa Ristekdikti
2	Pengumuman Peserta hasil Evaluasi Tahap Pertama	26 Januari 2019	Belmawa Ristekdikti
3	Batas waktu Laporan Kemajuan	18 Februari 2019	Belmawa Ristekdikti
4	Pengumuman Peserta Tingkat Regional	26 Februari 2019	Belmawa Ristekdikti
5	Kontes Tingkat Regional :		
	KRI Regional 3	04 – 06 April 2019	tbd
	KRI Regional 4	11 – 13 April 2019	tbd
	KRI Regional 1	25 – 27 April 2019	tbd
	KRI Regional 2	02 – 04 Mei 2019	tbd
6	Pengumuman Peserta Tingkat Nasional	05 Mei 2018	Belmawa Ristekdikti
7	Pelaksanaan Kontes Nasional	19 - 23 Juni 2019	tbd

Alamat Penyelenggara

Panitia Pusat Kontes Robot Indonesia 2019
Direktorat Kemahasiswaan
Direktorat Pembelajaran dan Kemahasiswaan
Kementerian Riset, Teknologi dan Pendidikan Tinggi.
Gedung D, lantai 4.
Jln Jenderal Sudirman, Pintu 1 Senayan
Jakarta Pusat 10270
Telp. 021 57946100 ext.0433,
Fax. 021-5731846, 57946085
Website : <https://kontesrobotindonesia.id>
E-mail : harunnasrullah@gmail.com;
Mailing list: kri@groups.eepis-its.edu dan krci@groups.eepis-its.edu

Informasi Lanjut

Panitia akan memberikan arahan dan informasi lanjut dalam milis:

kri@groups.eepis-its.edu,

Tim Peserta dapat membaca FAQ dengan langsung membuka situs resmi ABU Robocon 2019 di alamat :

<http://aburobocon2019.mnb.mn>

Borang Pendaftaran Peserta

KRAI - 2019

KONTES ROBOT ABU INDONESIA 2019
“Sang URTUU Agung Menyebarkan Pengetahuan”

(“GREAT URTUU: *Sharing the knowledge*”)

Borang Pendaftaran/Proposal

1. Setiap Perguruan Tinggi hanya diperkenankan mengirim **satu** proposal KRAI kepada panitia pusat pelaksana KRI.
2. Borang pendaftaran harus disetujui oleh Rektor/ Direktur/ Ketua/ Wakil Rektor bidang Kemahasiswaan Perguruan Tinggi calon peserta.
3. Borang pendaftaran/proposal harus sudah diterima panitia Kontes Robot Indonesia 2019 paling lambat tanggal 22 Januari 2019, dengan alamat:

SoftCopy di Unggah Kealamat : <https://kontesrobotindonesia.id>

Dan dikirim ke email : harunnasrullah@gmail.com;

HardCopy dikirim ke-alamat:

Panitia Pusat Kontes Robot Indonesia 2019
Direktorat Kemahasiswaan
Direktorat Pembelajaran dan Kemahasiswaan
Kementerian Riset, Teknologi dan Pendidikan Tinggi.
Gedung D, lantai 4.
Jln Jenderal Sudirman, Pintu 1 Senayan
Jakarta Pusat 10270
Telp. 021 57946100 ext.0433,
Fax. 021-5731846, 57946085

4. Hardcopy Proposal dijilid dengan kulit **warna merah muda** jadi satu bendel (jilid), berisi informasi lengkap tentang nama anggota tim, nama pembimbing, institusi, alamat lengkap, nomor telepon, e-mail, dan nomor hp, yang mudah dihubungi, serta informasi lengkap tentang robot yang akan dibuat meliputi desain, gambar konstruksi, strategi, dan algoritma pengendalian robot dan lainnya.
5. Proposal tidak boleh melebihi maksimal 25 (duapuluh lima) halaman termasuk semua gambar, daftar isi dan lampiran.
6. Masing-masing tim mengirimkan hanya satu set proposal ke-panitia KRI 2019.
7. Softcopy Proposal dikirim ke alamat website KRI, <https://kontesrobotindonesia.id> sesuai dgn informasi dalam panduan.
8. Proposal akan diseleksi Panitia KRI sesuai dengan kriteria seperti telah disebutkan dalam buku panduan KRAI. Tim yang lolos seleksi administrasi akan diumumkan pada tanggal 26 Januari 2019.

INFORMASI RINCI DARI TIM

1. TIM PESERTA

Nama Tim (Maksimum 15 huruf, gunakan nama yang mudah dibaca.) :	
Nama Ketua Tim (mahasiswa) : _____	Nama Pembimbing (sbg Contact Person)
Nama Anggota Tim (mahasiswa):	
1. _____ 2. _____	

2. INSTITUSI

Nama Politeknik/Institut/Universitas lengkap	
Alamat Lengkap dan Jelas, dengan nama Kota:	
Nomor Telepon:	Nomor Fax. :
Alamat e-mail :	

3. Alamat lengkap yang mudah dihubungi, hp, telepon, fax, e-mail.

(contact person address)

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INFORMASI LENGKAP MENGENAI ROBOT

1. Nama Tim : _____

(gunakan nama tim yang mudah dibaca, maks. 15 karakter)

2. Robot :

Jenis Robot yang dibuat, Robot MR1 dan Robot Otomatis MR2

Jelaskan mengenai Robot yang akan dibuat, Robot MR1 dan Robot MR2, manual/semi-otomatis/full-otomatis, ukuran dimensi saat start dan saat beroperasi, Cara mengambil Shagai, cara gerakan kaki MR2, penggunaan sensor, dan cara lempar yang akan digunakan, sistem kendali robot, dilengkapi dengan sketsa gambar bagian-bagian robot serta strateginya. Gunakan halaman tambahan bila dirasa kurang untuk menggambarkan masing-masing unit.

Tambahkan keterangan lain yang perlu untuk robot anda.

Gunakan halaman tambahan bila dibutuhkan.

3. STRATEGI

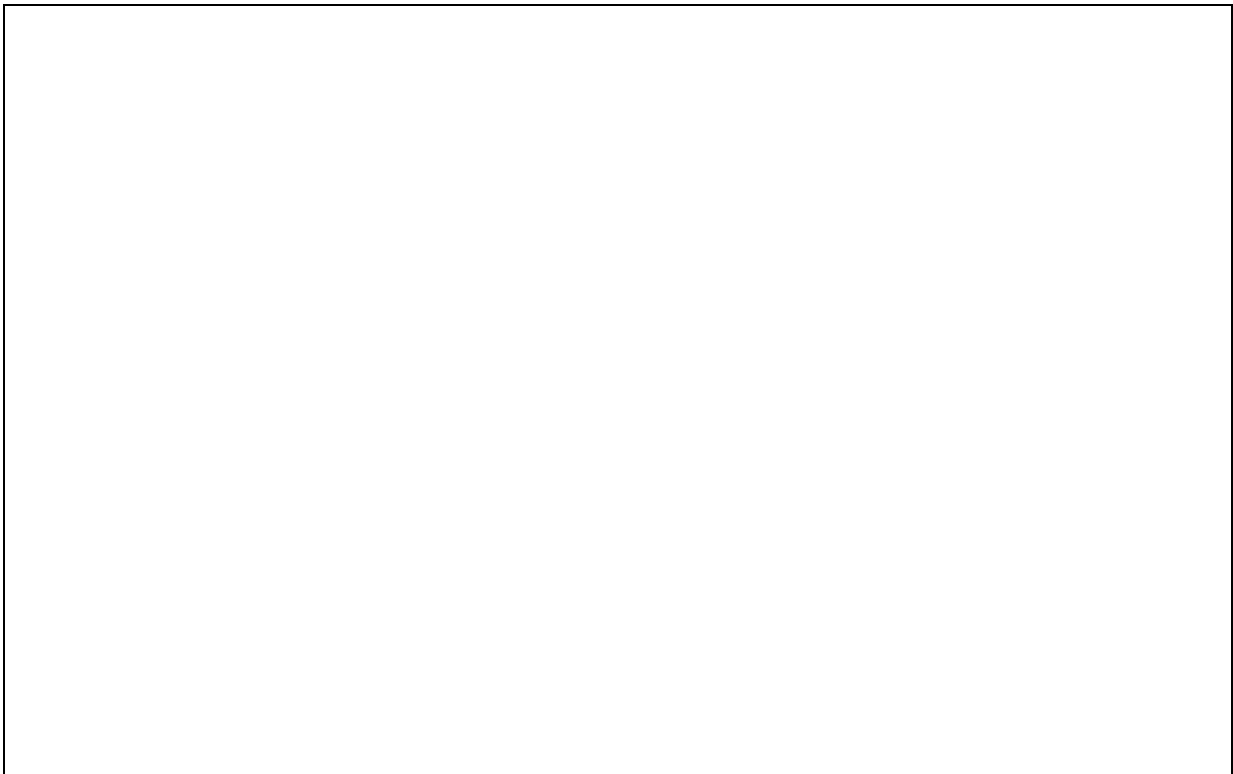
Jelaskan bagaimana strategi yang digunakan untuk mendapatkan nilai selama pertandingan. (cara gerakan robot berkaki, untuk mencapai zona, cara menyerahkan Gerege, cara mengambil dan melempar shagai kedalam drop zone, serta hal-hal yang lain nya yang dirasakan perlu.)



Gunakan halaman tambahan bila dibutuhkan..

4. SKETSA GAMBAR

Sketsa gambar desain lengkap dengan ukuran untuk konstruksi robot. Tambahkan gambar lengkap jika diperlukan. Gambar/skema robot hanya mencantumkan nama tim.



Gunakan halaman tambahan bila dibutuhkan.

Tema dan Peraturan
ABU ROBOCON - 2019

ABU
Asia-Pacific Robot Contest 2019
Ulaanbaatar, Mongolia



THEME & RULES
“GREAT URTUU”

August 2019
ABU Asia-Pacific Robot Contest 2019 Ulaanbaatar, Mongolia
Organizing Committee

<http://aburobocon2019.mnb.mn>

Contest Theme “GREAT URTUU”

Slogan: “Sharing the knowledge”

The concept of the contest:

The mission of the ABU Robocon 2019 Ulaanbaatar is to deliver information fast by using a relay messenger system - the Urtuu, which was first innovated in the world by the nomadic Mongolians. For exchanging information in a long distance, Mongolians had been using the Urtuu system as a messenger for rest (feeding, replacing a horse, etc.), and in some cases, relay to another messenger. By using the Urtuu system, a messenger was able to travel in distance of 400 kilometres per day. At present days, we are going through massive and abrupt development of exchanging and sharing knowledge and information. This Urtuu system was an important invention that opened a new door for us to exchange and share the knowledge in regardless of space. Based on this concept, ABU Robocon 2019 Ulaanbaatar is designed to promote the idea of “Sharing the knowledge”.

A match is between Red and Blue teams. It lasts three minutes at most. Each team has one manual robot known as Messenger-Robot 1, and one automatic robot known as Messenger-Robot 2. The automatic robot has four legs as of horses while wheels are not allowed. The manual robot carries the Gerege as a testimony from the Khangai urtuu, which is the the starting point. It goes along Forest, Bridge, and crosses the Line 1 next to Gobi urtuu, which is the starting point of the automatic robot. After Messenger-Robot 1 reaches Gobi urtuu, Messenger-Robot 1 passes Gerege to Messenger-Robot 2 at Gobi urtuu. Once Messenger-Robot 2 successfully receives Gerege, it can go along the Gobi area. Messenger-Robot 2 must go by four legs, like a horse, and cannot use wheels to move. Messenger-Robot 2 passes through Sand dune and Tussock, and directs to Mountain urtuu. After Messenger-Robot 2 reaches Mountain urtuu, Messenger-Robot 1 can enter Throwing zone to throw Shagai, and must earn 50 or more points. In case that Messenger-Robot 1 earns 50 or more points, Messenger-Robot 2 is allowed to climb the Mountain. Afterwards, if it reaches Uukhai zone and raises the Gerege first, the team is the winner, which is called “UUKHAI”.

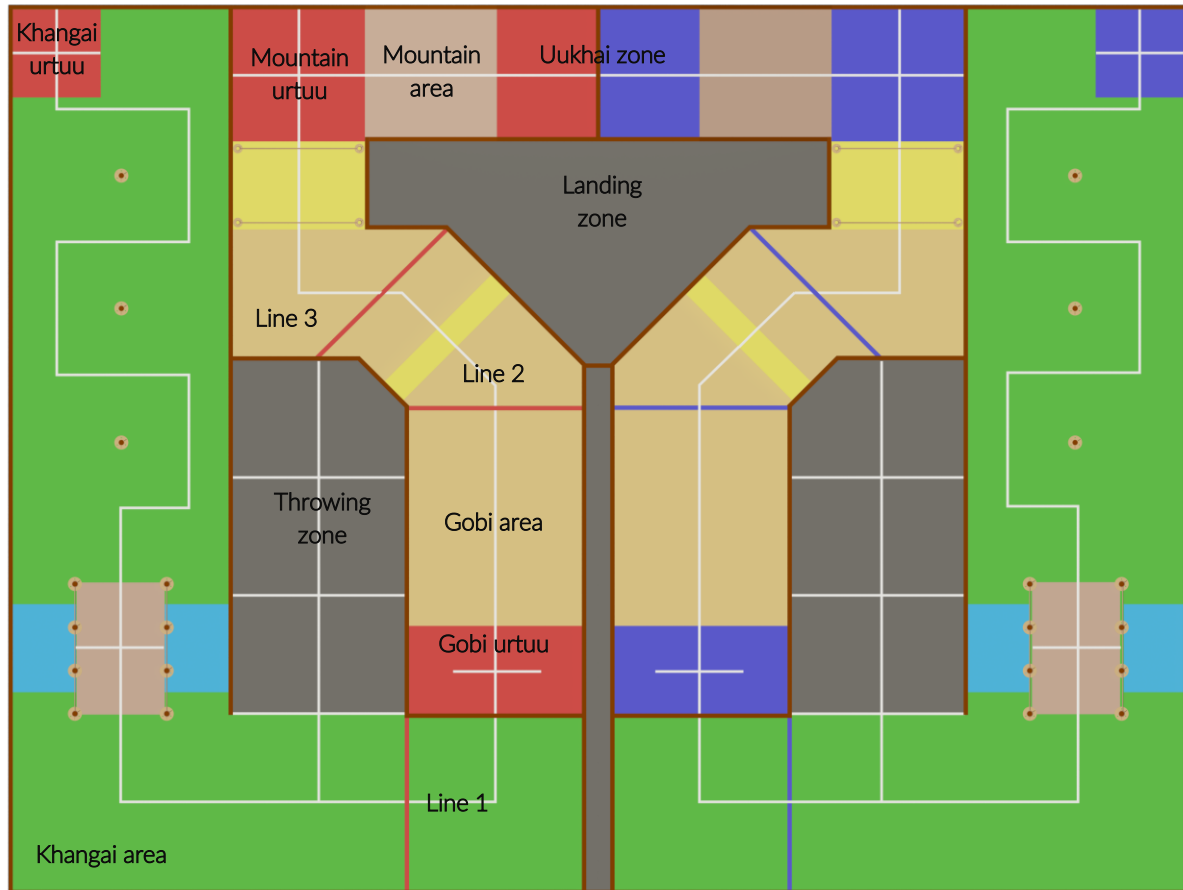


Figure 1. Game field- Areas and Zones

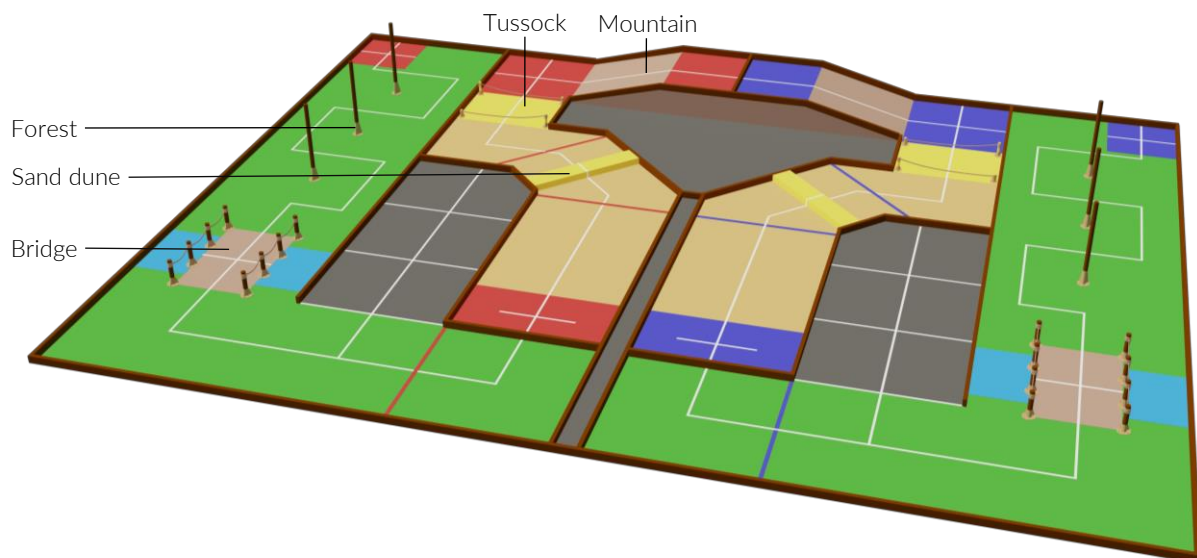


Figure 2. Game field- Objects

Importance of Safety

Safety is one of important elements in the sustainable development of the ABU Robocon.

The safety of the designed robots is the first and foremost issue for the safety principle of the contest. The participating teams, as the robot's designers, are responsible for the safety of their robots.

The teams must work and cooperate closely with the organizers to ensure the utmost safety of the contest.

Safety must always be the top priority and must be considered by all people involved in the contest including officials, participants and spectators in all circumstances.

Teams are required to pay sufficient attention to the safety of their robots before applying to take part in the contest.

It must be observable whether the designed robots meet the safety during the video check and test runs.

Team members must wear running shoes, helmets, and safety goggles during the matches and test runs.

Domestic Contest in Each Country and/or Region

Since all domestic contests in each country and/or region are organized in order to find the representatives to participate in ABU Robocon 2019 Ulaanbaatar, they should conform to the rules. It is known that materials may not be available in some places. Domestic organizers are advised to use the best possible materials and adhere as closely as possible to the specifications laid down for the final contest.

Transporting the Robots

1. The robots must fit inside a single box with the dimension of 1000 mm Width x 1800 mm Length x 800 mm Height for transport. Only one box is used. The weight of the box, including the robots, must not exceed 240 kilogrammes.
2. As for ABU Robocon 2019, the robot delivery time to Ulaanbaatar is expected to take longer than past years. Therefore, the robot pick-up time could be as early as early July. Please ask participants to prepare for the contest by taking it into consideration.

The contest outlines

Title:	Asia-Pacific Robot Contest 2019 Ulaanbaatar, Mongolia (Alias: ABU Robocon 2019 Ulaanbaatar)	
Organizer:	ABU (Asia-Pacific Broadcasting Union)	
Host:	Mongolian National Broadcaster, The Organizing Committee of Robocon 2019 Ulaanbaatar, Mongolia	
Contest Date:	Sunday, 25 August 2019	
Contest Venue:	Buyant Ukhaa Sport Palace	
Schedule:	Friday, 23 August	Participants' Arrival
	Saturday, 24 August	Orientation, Test-run, Rehearsal
	Sunday, 25 August	Contest Day
	Monday, 26 August	Friendship Exchange Programme,
ABU Meetings:	Tuesday, 27 August	Participants' Departure
Theme and rules	'Great Urtuu'	
Competition Method:	Preliminary League and Final Tournament	
Participants:	To be confirmed in July 2019	
Awards:	ABU Robocon award, Grand Prix, 1st runner-up, 2nd Runner-ups, Best Idea Award, Best Engineering Award, Best Design Award, Special Awards.	

Rules

Terms and Definitions

Terms and definitions which are used in the rules of ABU Robocon 2019 Ulaanbaatar, are given in the following table.

#	Term	Definition
1	Messenger-Robot 1 (MR1)	Either a manual or semi-automatic or fully automatic robot. It passes the Gerege to Messenger-Robot 2 and throws the Shagai to earn a point.
2	Messenger-Robot 2 (MR2)	An automatic robot. It has to move only on four legs, like a horse. Also, it brings the Gerege to Uukai zone.
3	Gerege	An official document (a testimony) of the messenger. MR1 passes Gerege to MR2 and MR2 raises it on top of the mountain.
4	Shagai	The traditional game of the Mongolians - ankle bones of animals, especially sheep. In this game MR1 throws Shagai to score more than 50 points. 50 points, 40 points and 20 points are allocated to each face of the Shagai.
5	Urtuu	Relay station or starting zone.
6	Khangai area	The green area, Forest, Khangai urtuu and Bridge of the Game Field .
7	Forest	The obstacle that MR1 has to go through.
8	Bridge and River	The obstacle that MR1 has to cross over. MR1 crosses the river over the bridge.
9	Gobi area	The dark yellow area, Gobi urtuu, Sand dune and Tussock of the Game Field.
10	Sand dune	A timber that MR2 has to cross over.
11	Tussock	The obstacle made of ropes that MR2 has to cross over.
12	Mountain area	Mountain urtuu, Uukhai zone and the slope that MR2 has to climb.
13	Khangai urtuu	MR1 starting zone
14	Gobi urtuu	MR2 starting zone
15	Mountain urtuu	The zone that MR2 stays while MR1 earns 50 or more points by throwing Shagais.
16	Uukhai zone	The zone that MR2 raises the Gerege to be a winner.
17	Line 1, 2, 3	The task is completed when the lines are crossed. Crossing the Line 1: The robot comes from Khangai urtuu, crosses the entire line. Crossing the Line 2, 3: The robot travels from Gobi urtuu to Mountain urtuu on four legs.
18	Throwing zone	Zone where MR1 throws Shagai.
19	Landing zone	Zone where the thrown Shagai lands .
20	UUKHAI	Shout for joy or in praise or encouragement.
21	Moving on four legs	Each of the four legs must touch and leave the field. Shuffling is not allowed. Mechanism whose contact area with the field rotates 360 degrees is prohibited. MR2 must not have wheels in the contact area with the field.

1. Game Procedure and Competition Tasks

Each team has to complete tasks in the following orders:

1.1. Setting of robots

- 1.1.1. Team must set up their robots in a one minute 'setting-time' before the game starts.
- 1.1.2. Three (3) team members and up to three (3) pit crew members is allowed to participate in the set-up process.
- 1.1.3. If the team that fails to complete setting up within one minute, they can resume setting up after the game has started. Once setting up is finished, the team can start their robot with permission from referee.

1.2. Deployment of the robots at the start of the game and team members during the game

- 1.2.1. MR1 must start from Khangai urtuu. The robot must fit into the Khangai urtuu including its space above.
- 1.2.2. MR2 must start from Gobi urtuu. The robot must fit into the Gobi urtuu including its space above.
- 1.2.3. All team members have to be outside the game field. Only MR1's operator is allowed to be inside the game field. However, the operator must not run while controlling MR1.
- 1.2.4. If an operator needs to be inside the game field, the operator can be in the Khangai area and Throwing zone only.
- 1.2.5. If MR1 is designed as a fully automatic robot, all team members must be outside the game field except during start of operation or a retry.
- 1.2.6. MR1 is allowed to enter outside of the space above the Khangai Area and Throwing zone. MR2 is allowed to enter outside of the space above the the Gobi Area and Mountain Area. However, both robots must not enter the space above opponent team's field.

1.3. The Gerege and Shagai

- 1.3.1. Each team uses one Gerege and three Shagais that are prepared by a host organizer.
- 1.3.2. MR1 must hold the Gerege when the game starts.
- 1.3.3. Each team uses three Shagais, and they must be placed in the Khangai area when the game starts. Teams decide where to place them by themselves.
- 1.3.4. Team members are not allowed to touch the Gerege and Shagais except during setting time or a retry.

- 1.3.5. Carrying the Gerege:
 - 1.3.5.1. MR1 must carry the Gerege vertically. (Holed-side is an upside)
 - 1.3.5.2. MR1 is allowed to tilt the Gerege in the range up to 45°.
 - 1.3.5.3. When MR 1 holds Gerege, at least 70% of one side of the Gerege must be visible.
 - 1.3.5.4. Messenger-Robot 1 must carry the Gerege higher than its upper body, while Messenger-Robot 2 must carry it lower than its upper body.
- 1.4. Task in the Khangai area
 - 1.4.1. MR1 starts from Khangai urtuu with the start sound. It runs along Forest, River and crosses the Line 1. 'Crosses the line' is considered successful when all of the contact surfaces of the robot make contact with the field in front of the Line.
 - 1.4.2. MR1 has to travel through the forest according to the route indicated by white guidelines.
 - 1.4.3. When travel through Forest, MR1 can touch trees/woods but must not use it for changing direction or moving.
 - 1.4.4. MR1 has to cross the River over the Bridge.
- 1.5. Passing the Gerege
 - 1.5.1. After crossing Line 1, MR1 passes Gerege on to MR2.
 - 1.5.2. MR1 cannot physically touch MR2 while passing the Gerege. However, MR1 can start MR2 by giving sign or pushing start button of MR2 through Gerege.
 - 1.5.3. Throwing the Gerege is prohibited. The robots can only hand over the Gerege. When passing on the Gerege there must be a moment that both robots are in contact with Gerege at the same time.
 - 1.5.4. It is considered "successfully passed" only when MR1 is separated from the Gerege, and MR2 holding the Gerege.
 - 1.5.5. When carrying Gerge, MR2 doesn't have to hold it vertically and the Gerge doesn't have to be visible.
- 1.6. Task in the Gobi area
 - 1.6.1. When MR2 received Gerge and move on to crosses the Line 2, the team gets points. 'Cross the line' means, all contact surface of each of four legs of MR2 must be in contact with the field beyond the Line. It is unnecessary for all of the four legs are in contact with the field at the same time.

- 1.6.2. When MR2 travel through Sand Dune and crosses the Line 3, the team gets point.
- 1.6.3. When MR2 travel through Tussock and reaches Mountain urtuu, the team gets points. 'Reach' means that all of the contact surfaces of each of four legs of MR2 make contact with the Mountain urtuu. It is unnecessary for all of the four legs are in contact with the urtuu at the same time.
- 1.6.4. After MR2 reaches the Mountain urtuu, MR2 has to wait there.
- 1.7. Throwing a Shagai
 - 1.7.1. Once MR1 successfully passed Gerege on to MR2, MR1 can pick up Shagai.
 - 1.7.2. Once MR2 successfully reached Mountain urtuu, MR1 can enter the Throwing zone and throw a Shagai.
 - 1.7.3. MR1 can hold and throw only one Shagai at a time. MR1 can throw 3 Shagais until the team scores more than 50 points by throwng Shagai.
 - 1.7.4. MR1 cannot damage shagai with actions such as, sticking or grasping too hard.
 - 1.7.5. When MR1 earns 50 or more points by throwing Shagai, referee raises flag for confirmation.
 - 1.7.6. If Shagai landed on the team's own field or landed out of the field, team can apply for 'Shagai Retry'. With permission from referee, team member can pick up the thrown Shagai and return it to Khangai area. During this time the team member must stop MR1. Once shagais is arranged, team member can activate MR1 with a permission from referee. Then MR1 can re-throw Shagai.
 - 1.7.7. If a Shagai thrown by MR1 lands in the opponent's game field, the team is disqualified, and the opponent is the winner by knockout.
- 1.8. Climbing the Mountain
 - 1.8.1. After MR2 reaches the Mountain urtuu, with referee's permission, team members can enter the Mountain urtuu and touch MR2 to stop MR2 and change programme and/or re-arrange direction of MR2.
 - 1.8.2. As MR1 earns at least 50 points by throwing a Shagai, MR2 is allowed to climb the Mountain.
 - 1.8.3. Signal to start climbing the Mountain can be given by a team member without any physical contact.

- 1.8.4.** Once MR2 reaches Uukhai zone, MR2 can raise Gerege vertically above its upper body. 'Reach Uukhai zone' means that all of the contact surfaces of each of four legs of MR2 make contact with the Uukhai zone. It is unnecessary for all of the four legs are in contact with the zone at the same time. The team that raises The Gerege first is the winner of the game by knockout that is called "UUKHAI". 'Raising vertically' means, while MR2 raise Gerege, MR2 can tilt the Gerege in the range up to 45° with at least 70% of one side of the Gerege must be visible.
- 1.9.** Team members cannot touch robots except during retry, start, and when MR2 reached the Mountain urtuu.
- 1.10.** In case of an emergency, with permission from referee, one team member can enter the contest field to push emergency stop button.

2. Retries of the Robots

- 2.1.** A retry can be made only with/after referee's permission.
- 2.2.** Team members must place the robots at an assigned restart position while preparing for a retry.
- 2.3.** There is no limits for retry. A retry is considered by the rule with approval from the referee.
- 2.4.** A retry is compulsory when the robots hold Gerege in the way that deviated from the prescribed range or drop the Gerege or violate the rules.
- 2.5.** Restart position after a retry of the robot is the last leaving Urtuu or before the Line that is the last crossing. If restart from urtuu, the robot must restart from the position which all of the its contact surface with the field must be inside of the urtuu. If restart from one of the Lines, the robot must restart from the position of 'stride over' the Line.
- 2.6.** Strategies premised on the use of retries are allowed.

3. Deciding of Winner

- 3.1. The first team that MR2 successfully climbs the Mountain and raises the Gerege is the winner of the game by knockout. The winning is called “UUKHAI”.
- 3.2. If neither team achieves “UUKHAI” at the end of the 3 minutes match, the winner is decided based on the earning scores. The team that earns higher score is the winner. The score for each task is described as follows:

Tasks	Points
MR1 crosses Line 1 successfully	20 points
MR1 passes the Gerege successfully	20 points
MR2 crosses Line 2 successfully	30 points
MR2 crosses Line 3 successfully	30 points
MR2 reaches Mountain urtuu successfully	30 points
MR2 reaches Uukhai zone successfully	30 points
A Shagai lands in the Landing Zone. (Except horse or camel. See Appendix 10.8)	20 points
A Shagai lands in the Landing zone as a camel. (Grey. See Appendix 10.8)	40 points
A Shagai lands in the Landing zone as a horse. (Yellow. See Appendix 10.8)	50 points

*Points are given only once for completion each task.

3.3. Game results

- 3.3.1. The game result is announced at the end of 3-minutes match as a referee checks and confirms completion of each task.
- 3.3.2. End of match:
- 3.3.2.1. End of 3 minutes.
 - 3.3.2.2. One of teams is disqualified.
 - 3.3.2.3. One of teams achieves “UUKHAI”.
- 3.3.3. In case neither team achieved Uukhai, the winner is decided based on the following order.
- 3.3.3.1. The team that scored higher points.
 - 3.3.3.2. The team that first completes the final task.
 - 3.3.3.3. The team that lands a “horse” side of a Shagai.
 - 3.3.3.4. The team that lands a “camel” side of a Shagai.
 - 3.3.3.5. The team that is announced as winner by Judges.

4. Robots' Design and Development

Regulations for both MR1 and MR2.

- 4.1. Each team builds 2 robots: MR1 and MR2.
- 4.2. Each robot cannot be split into sub-units or connected by flexible cords.
- 4.3. Communication between robots is not allowed. However, communication through Gerege is allowed.
- 4.4. The robots are not allowed to suction or to stick the game field.
- 4.5. The robots are allowed to only touch inner side of fences where holding is not allowed.
- 4.6. The robots in the contest must be built by team members from the same university/college/polytechnics.
- 4.7. The weight of robots
Total weight of two robots, controller, cable, the primary set of batteries used in the game must not exceed 50 kg. Any other equipment that team brings for setup purposes and backup batteries (of the same type as that originally installed in the robot) are exempt.
- 4.8. The power source of the robots
 - 4.8.1. Each team shall prepare its own power source.
 - 4.8.2. Teams can use only batteries and/or compressed air as power source.
 - 4.8.3. All batteries used in the robot, controller, and any other device used during the game shall not exceed nominal voltage of 24V. However, when connecting batteries in series or in parallel, that total must be 24V or less.
 - 4.8.4. The voltage in the circuit should be set to 42 V or less by actual measurement: However, if the power supply system includes multiple isolated circuits, each system must be 42V or less.
 - 4.8.5. Teams using compressed air must use either a container made for the purpose, or a plastic bottle in pristine condition that is prepared appropriately. Air pressure must not exceed 600kPa.
 - 4.8.6. Any power source deemed dangerous may be banned from use.
- 4.9. Fail Safe Design
 - 4.9.1. When you have multiple power supply systems, you must design the circuits and mechanisms not to go out of control or move dangerously no matter which power supply is lost, or regardless of the order of turning on the power.
 - 4.9.2. When using radio for signal transmission, you must design so that circuits and mechanisms do not go out of control or move dangerously even if the connection is broken.

4.10. Use wires, connectors, terminals, etc. with a rated current that is equal to, or higher than the assumed maximum current.

4.11. Messenger-Robot 1 (MR1)

MR1 can be either a manual, semi-automatic or fully automatic robot.

4.11.1. MR1 must fit into the Khangai urtuu (Width1000mm X length1000mm). MR1 must have dimension of no larger than 1500 mm in width, length and height during the game.

4.11.2. The robot is allowed to expand, stretch or extend as long as the dimension is still within limit of dimension.

4.11.3. MR1 can be operated by the operator through a connected cable or wireless.

4.11.4. If MR1 is operated through a connection cable, the length of cable from robot to controller must be in between 1000 mm and 3000 mm.

4.11.5. Wi-fi and Bluetooth controllers are allowed to operate MR1. The organizer will not control Wi-Fi and Bluetooth.

4.11.6. An infrared, visible ray, sonar, sound, or radio frequency remote control is prohibited.

4.11.7. The operator is not allowed to ride on the robot.

4.12. Messenger-Robot 2 (MR2)

4.12.1. MR2 must have dimension of no less than 400 mm in width, length, and height. It may not exceed 800 mm width, 1000 mm length and 800 mm height during the game.

4.13. Examination of the robots

4.13.1. Participating robots are examined prior to the test run on the day before the contest, and again on the day of the contest before it begins. The team that fails the examination is not permitted to participate in the test run or contest.

5. Violations

A retry is compulsory after each violation. The violations are categorized as follows:

5.1. Any part of any robots or the Gerege lands out of the game field.

5.2. Any part of any robot enters an area that is not allowed during the current task.

5.3. Any part of MR1 touches MR2.

5.4. Any team member touches any part of robot except controller or cable of MR1 and the situations this rulebook allows.

5.5. The team makes a false start. The game (both teams) is restarted.

5.6. Other actions that infringe on the rules without mentioning in the disqualification are considered a violation.

6. Disqualification

A team is disqualified if it takes any of the following actions during the match:

- 6.1. The team intentionally damages or tries to damage the field, facilities, equipment or opponent's robots.
- 6.2. The robots enter the opponent's game field (including space area).
- 6.3. The robots drop a Shagai in the opponent's game field.
- 6.4. The team performs any acts that are not in the spirit of fair play.
- 6.5. The team fails to obey instructions or warning issued by referees.
- 6.6. The team has made the false start three times in the same match.

7. Safety

- 7.1. All robots must be designed and manufactured as to pose no danger of any kinds to any persons in the venue.
- 7.2. All robots must be designed and manufactured as to cause no damage to any robots of the opposing team or the field.
- 7.3. Emergency stop buttons must be built on all robots. If MR1 is a fully automatic robot, emergency stop buttons must be built on its controller.
- 7.4. The use of explosives, fire or dangerous chemicals is prohibited.
- 7.5. Accumulator, lead-acid batteries are prohibited.
- 7.6. In designing and preparing the laser or infrared, full care must be taken to protect all persons at the venue from harm during all procedures. In particular, the beams must be so oriented that they cannot shine into the eyes of the spectators.
- 7.7. If the laser is used, it must be of class 2 or less.

8. Teams

- 8.1. Each participating country or region in the contest can be represented by one team only. Mongolia, as the host country, may be represented by two teams.
- 8.2. A team consists of three students, called team members, and one instructor who all belong to the same college, university, or polytechnic. The three students on the team are entitled to participate in the match.

8.3. In addition, three members of pit crews are allowed to assist in the pit area, to carry the robots to the field, and participate in the setting of the robots. The members of the pit crew must be students of the same college, university or polytechnic as the team.

8.4. Participation of graduate or post-graduate students is not permitted.

9. Others

9.1. The legitimacy of any actions not provided in this rulebook is subject to the discretion of the referee.

9.2. The dimensions, weights, etc., of the field, facilities and equipment described in this rulebook have a margin of error of plus or minus 5% unless otherwise stated. However, the dimensions and weights of the robots as shown in the rulebook are the maximum and cannot be tolerated.

9.3. All questions should be addressed to the official website of the ABU Asia-Pacific Robot Contest 2019 Ulaanbaatar, Mongolia, <http://aburobocon2019.mnb.mn> FAQ section is provided on the site. Notification of any additions and/or corrections to this rulebook is made on the official website.

9.4. A set of one Shagai and Gerege will be provided by the organizer of the ABU Robocon 2019 to all participating broadcasters. If requested by teams or domestic contest organisers, these items are available for purchase. Please send inquiries to the official website.

10. Appendix

10.1. Game Field

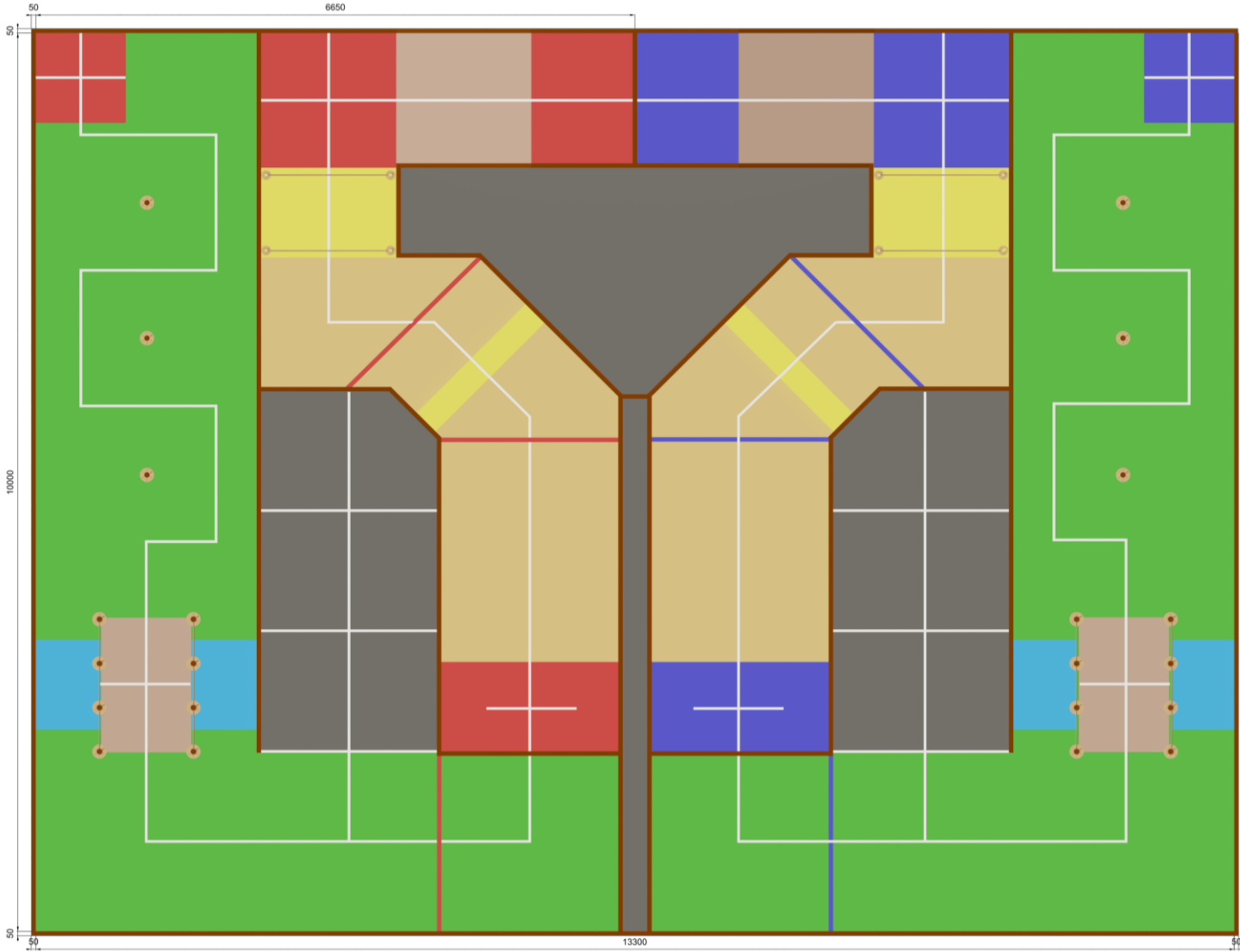


Figure 3. Top view

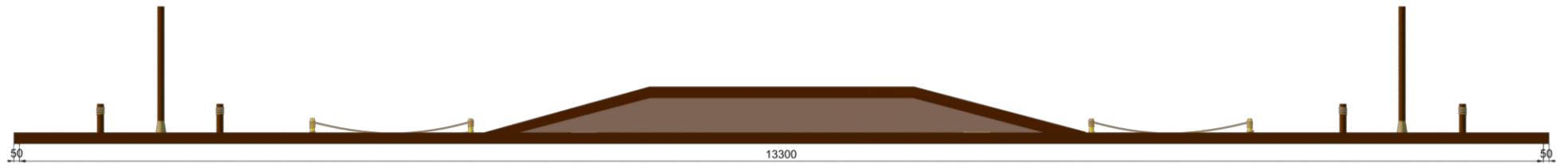


Figure 4. Front view

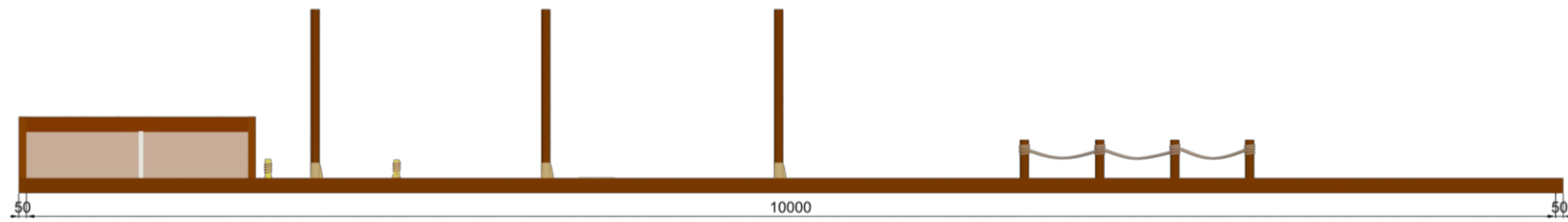


Figure 5. Side view

10.2. Forest

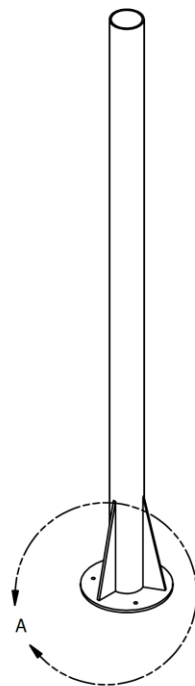
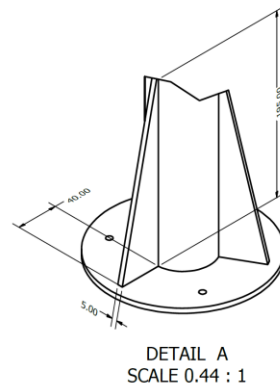
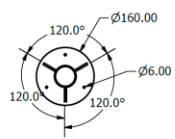
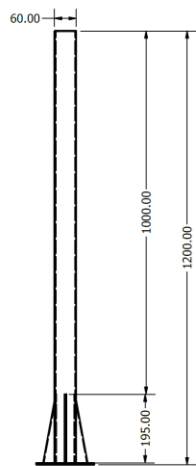


Figure 6. Forest

10.3. Bridge

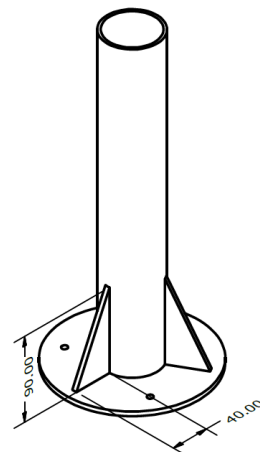
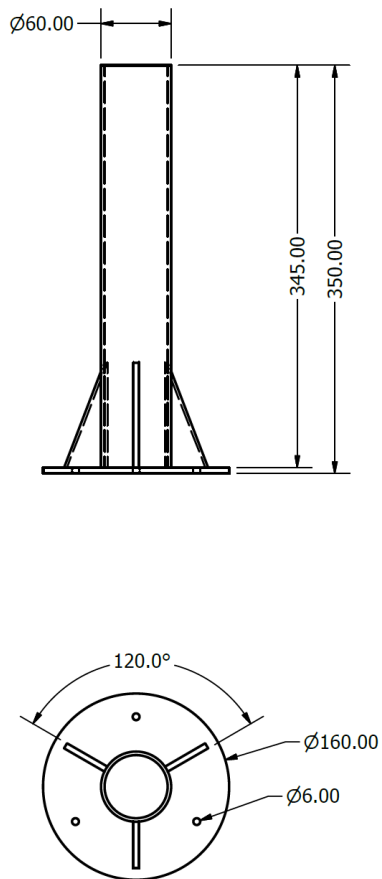
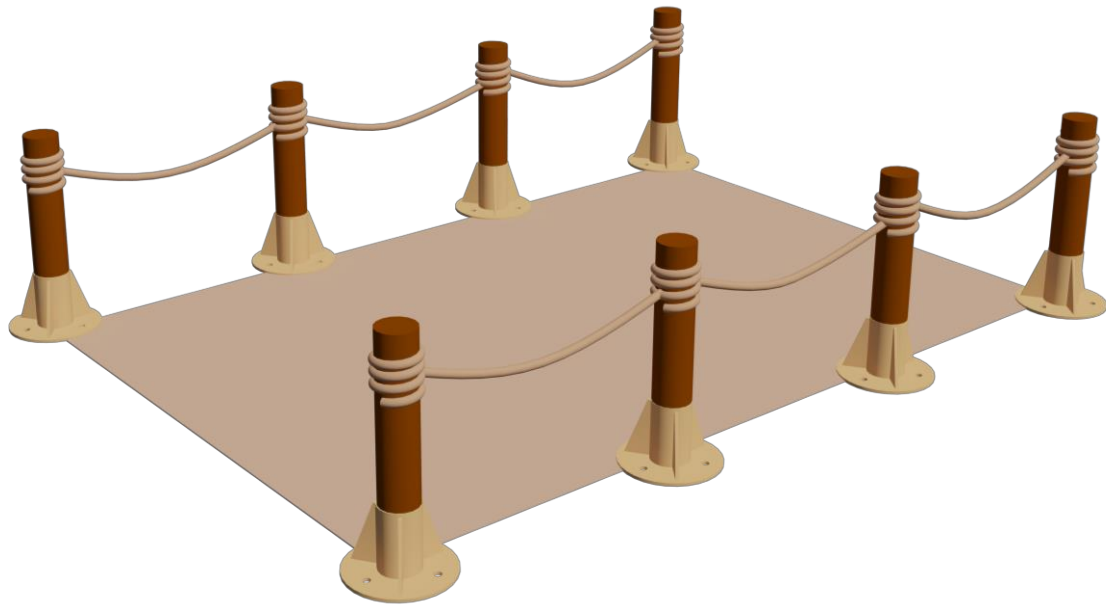


Figure 7. Bridge pole

10.4. Sand dune

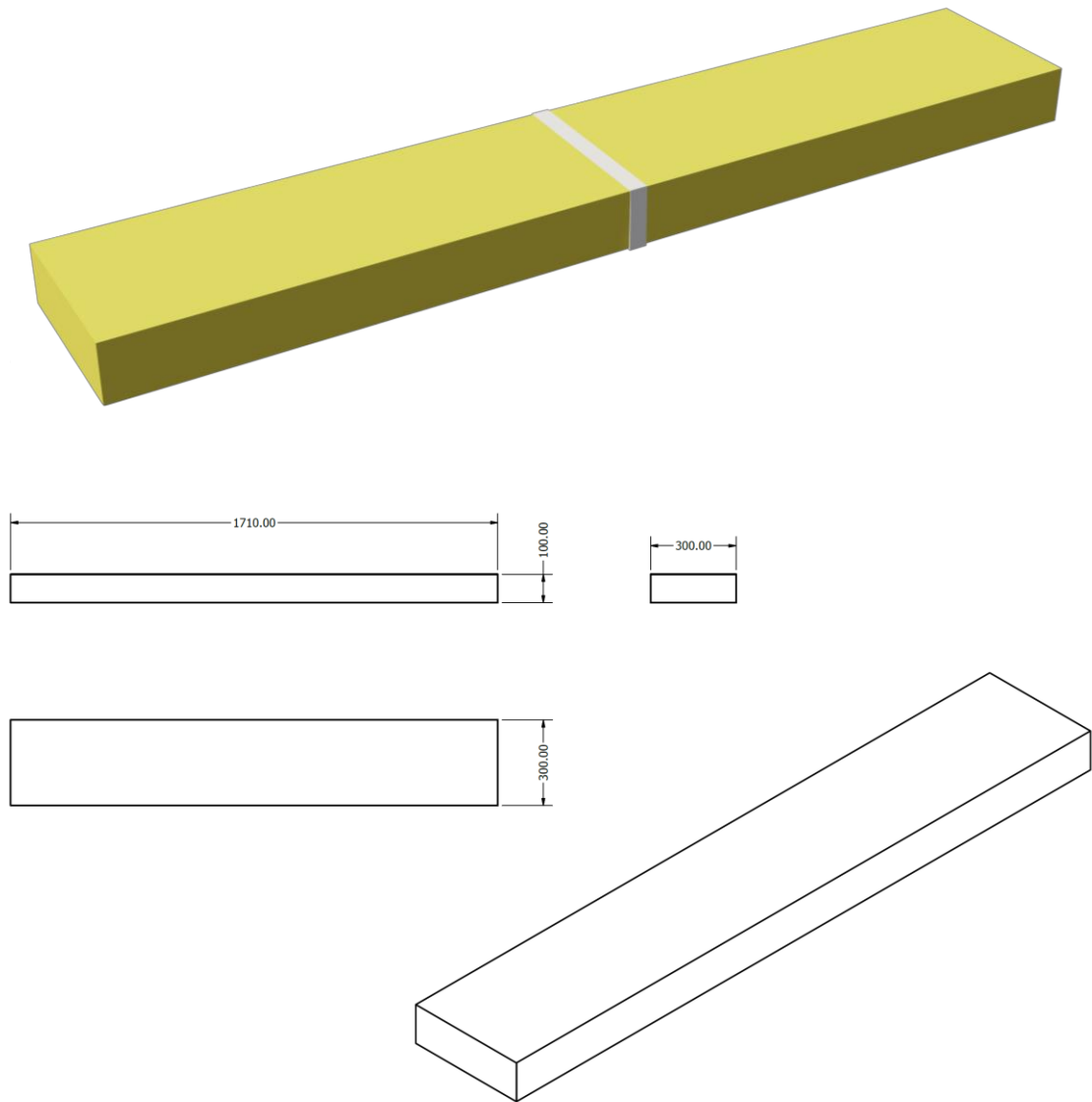


Figure 8. Sand dune

10.5. Tussock

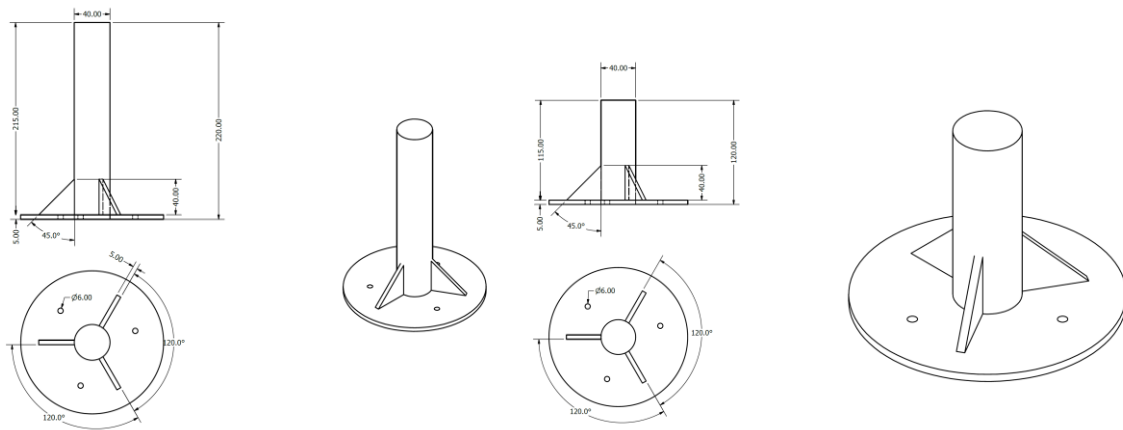
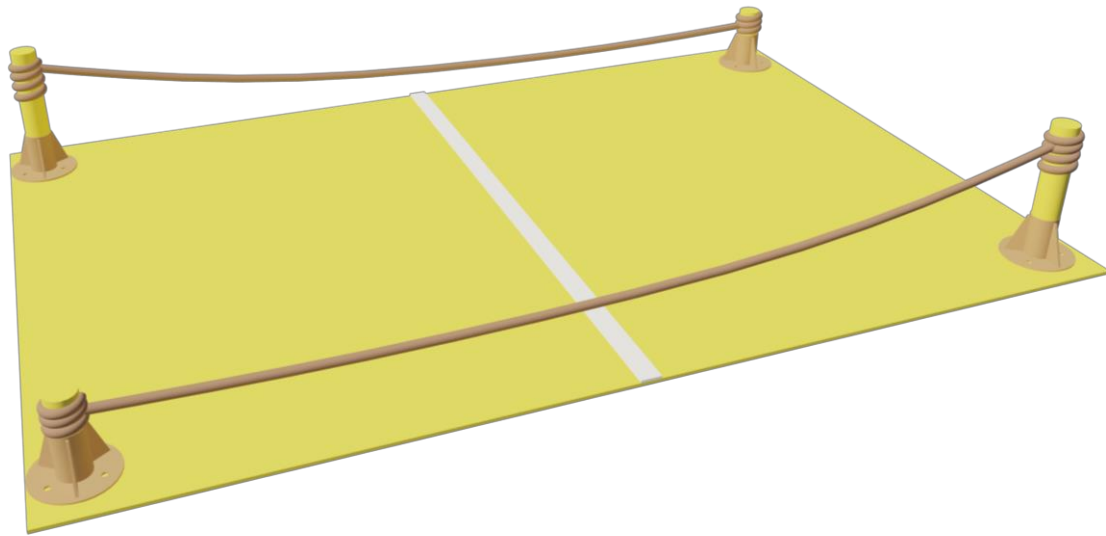


Figure 9. Tussock

10.6. Mountain

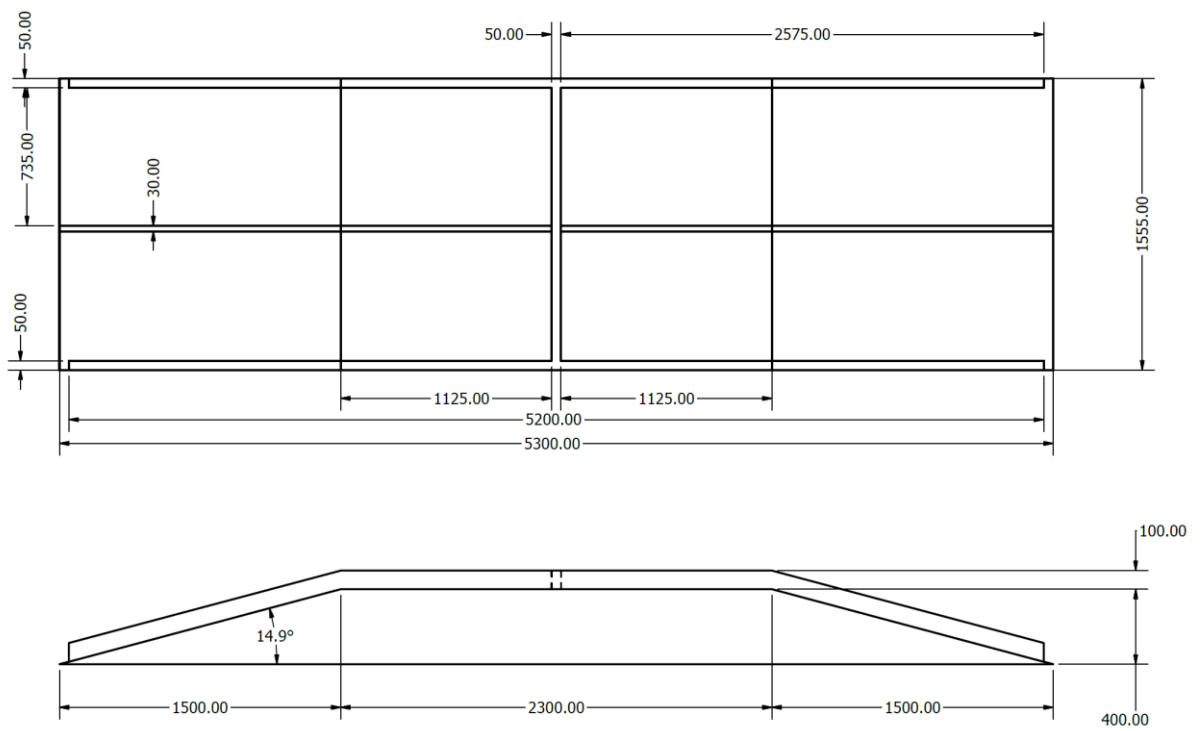
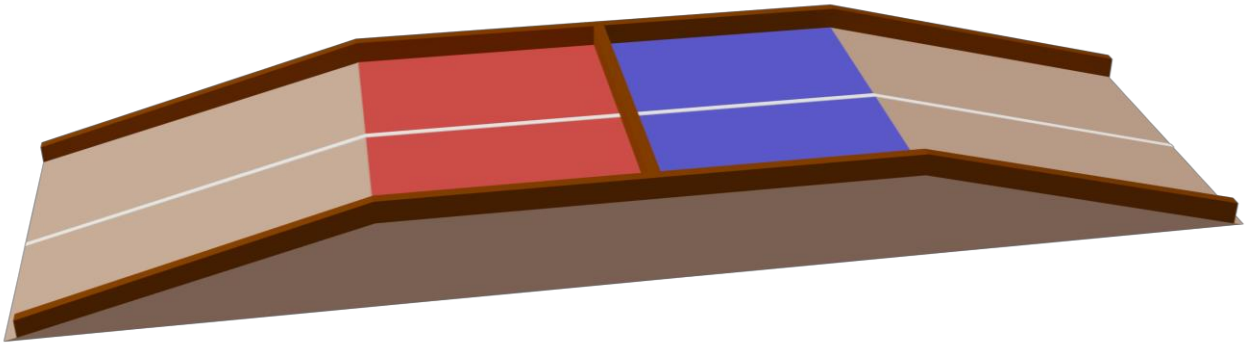


Figure 10. Mountain

10.7. Gerege

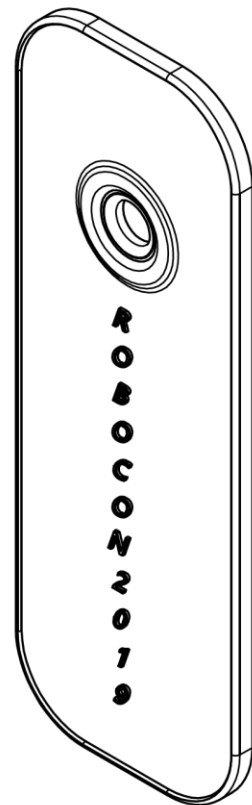
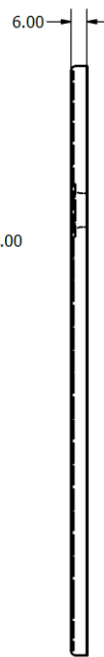
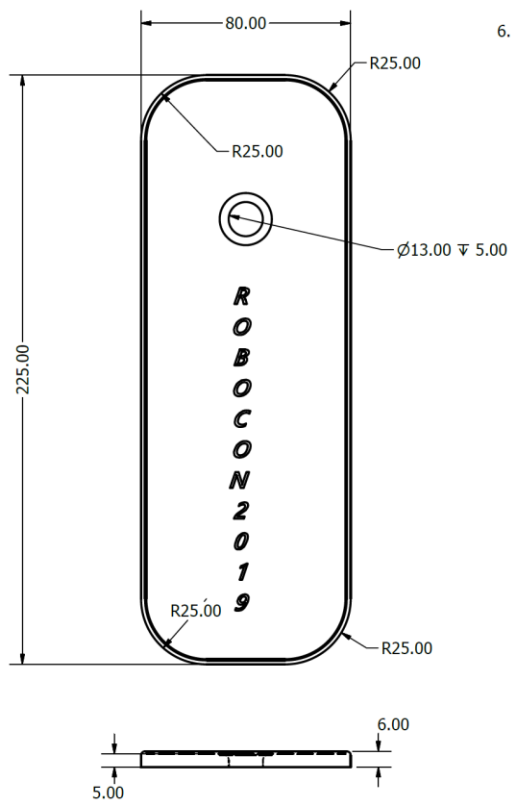
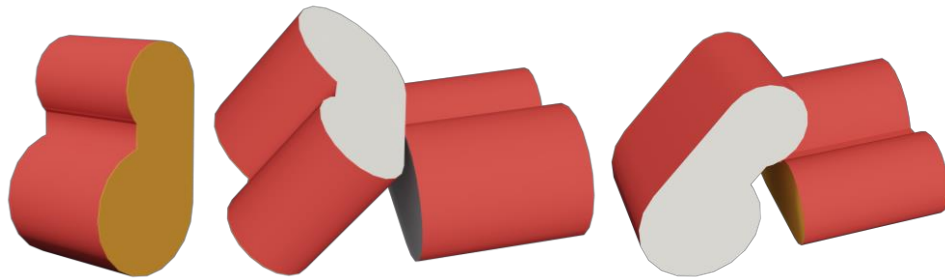
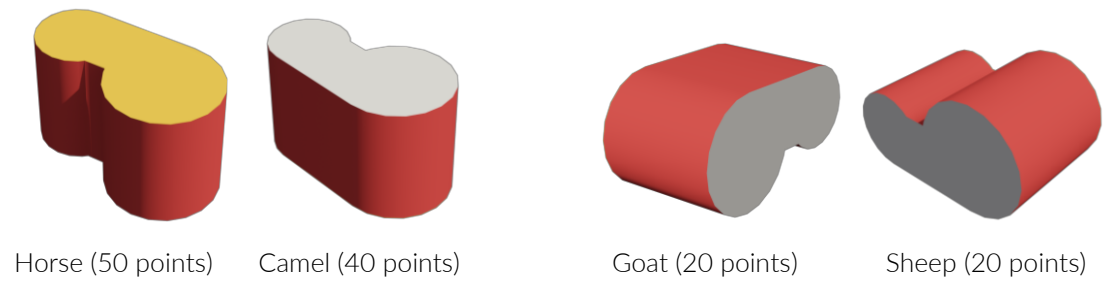


Figure 11. Gerege

10.8. Shagai



Tilt (20 points)

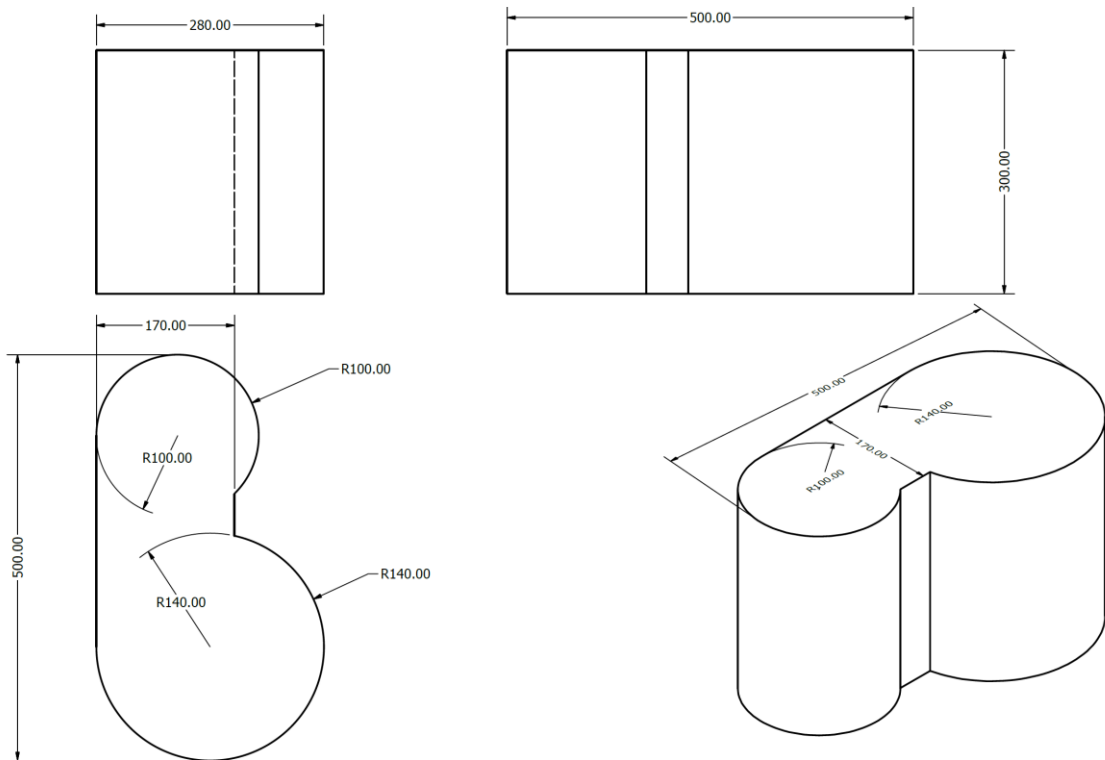


Figure 12. Shagai

10.9. Materials and colours of the contest tools

Items	Colours	Inventor (RGB)	Materials
Khangai urtuu	Light red	0 128 255	Plywood Water Paint
	Light blue	230 31 31	
Khangai area	Green		Plywood Water Paint
Gobi area	Dark yellow	115 112 105	Plywood Water Paint
Mountain	Light brown	193 166 145	Plywood Water Paint
Forest	Dark brown	240 114 41	Metal/Steel Oil Paint
Bridge	Light brown	193 166 145	Plywood Water Paint
Bridge pole	Dark brown	240 114 41	Metal/Steel Oil Paint
Bridge rope	Light brown	193 166 145	Nylon Rope
Line 1, 2, 3	Light red	0 128 255	Non-Shiny Vinyl Tape
	Light blue	230 31 31	
Guideline	White	245 245 245	Non-Shiny Vinyl Tape
Gobi urtuu	Light red	0 128 255	Plywood Water Paint
	Light blue	230 31 31	
Mountain urtuu	Light red	0 128 255	Plywood Water Paint
	Light blue	230 31 31	
Uukhai zone	Light red	0 128 255	Plywood Water Paint
	Light blue	230 31 31	
Landing Zone	Grey	115 112 105	Plywood Water Paint
Sand dune	Yellow	234 230 149	Plywood Water Paint
Throwing Zone	Grey	115 112 105	Plywood Water Paint
Tussock	Yellow	234 230 149	Plywood Water Paint
Tussock Pole	Dark yellow	115 112 105	Metal Oil Paint
Tussock Rope	Dark yellow	115 112 105	Nylon Rope
Fence	Dark brown	240 114 41	Wood Oil Paint
River	Light blue	78 178 215	Plywood Water Paint
Gerege (155 grams)	Dark yellow	213 191 130	Latten (An alloy of copper and zinc resembling brass)
Shagai (660 grams)	Yellow	234 230 149	Emulsion Paint
	Grey	115 112 105	Emulsion Paint
	Light red	0 128 255	High-density Polystyrene Emulsion Paint
	Light blue	230 31 31	High-density Polystyrene Emulsion Paint