
ABU ROBOCON 2010
CAIRO - EGYPT
ABU Asia-Pacific Robot Contest

Contents

Historical Background

The Pyramids of Giza and other monuments on the Giza Plateau are among the great world treasures. In fact, the Pyramids are the icons of world heritage in general and are widely pictured as such. The site covers an area of 2 x 2 km. It includes the three Pyramids of Khufu, Khafraa and Mankaura private tombs and the Sphinx (Figure 1). The Pyramid complexes belong to three rulers of the 4th Dynasty. Khufu Pyramid was completed around 2560 B.C.E. Occasionally, the Great Pyramid is referred to as "Khufu", as a common trend is to refer to a Pyramid by its honored king, and not by who built it. Presently, there exist a little over 70 surviving large Pyramids, but the largest and perhaps the most recognizable of all is the Great Pyramid at Giza, which also represents the only surviving Wonder of the Ancient World [John A.R. Legon, http://www.legon.demon.co.uk/].

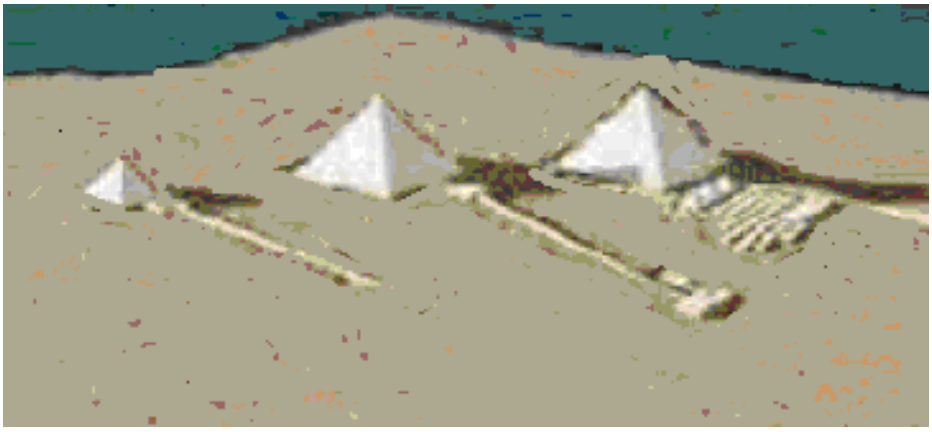

Figure 1: Virtual Image of the Giza Pyramids Site

Merriam-Webster defines a Pyramid as, "A polyhedron having for its base a polygon and for faces triangles with a common vertex". In the Great Pyramid's case, the base polygon is a square with sides originally measuring 230.362 meters and currently measuring 227 meters, due to the weathering that took place over the millennia. The common vertex formed by the four triangles is called the Pyramid's apex. The height from the base to the apex was originally 146.65 meters, as marked by an iron post erected on the summit, but is now about 137 meters tall.

There were approximately 2,500,000 total blocks that made up the Pyramid. This number varies a lot because of the Pyramid's erosion through the years and the removal of

the casing stones. On average, the stones weigh about 3 tons each, although some may have weighed about 15 tons. Their average volume is one cubic meter. There were approximately 209 layers, or courses, to the Great Pyramid. Many Pyramid researchers noticed that as the levels increase (from the ground up), the blocks tend to get smaller, so the larger stones tend to be towards the bottom. Therefore, it is easy to infer that the height of the lower courses tends to be greater than the upper courses.

Architectural Point of View: When approaching, from the Nile Valley, the plateau of rock upon which stand the three Pyramids of Giza, the visitor may be surprised to find that the scene is dominated, not by the largest or Great Pyramid, but by the Second Pyramid. Although the Great Pyramid is considered to have been built first, it occupies neither the highest ground nor the most central position, but instead is situated on the lower part of the plateau, very close to the northern cliff. This position required that the causeway to the temple on the east, or valley side, be supported by a massive ramp in ascending the cliff, to a height of nearly 100 feet. If the builders of the Great Pyramid had the entire plateau at their disposal, why did they not choose the more favorable setting of the central or Second Pyramid – the causeway of which ascends a natural incline?

While the site chosen for the Second Pyramid gave an advantage in height over the base of the Great Pyramid, of some 30 feet, it seems strange that use was not made of the still higher and more level ground, further to the northwest. Instead, the Pyramid was built where the natural rock-surface sloped downwards considerably towards the southeast, so that the site had to be artificially leveled. This was achieved by the cutting away of a deep escarpment along the north and west sides, while a megalithic foundation platform was built to support the southeast corner.

Similarly in placing the Third Pyramid; the northeast corner and the temple on the east side required to be supported, where the natural rock fell away, by a massive substructure to a height of up to 15 feet. Why was such work undertaken when use could have been made of more level ground, further to the west? These details suggest that there was some factor, more important than considerations of architectural setting or ease of construction, which determined where the three Pyramids were positioned. Another indication is given by the very regular arrangement of these Pyramids on the plateau (Figure 2). Firstly, the square bases are accurately aligned with respect to the four cardinal points, the Great and Second

Pyramids having the same orientation within two minutes of arc. Secondly, the three Pyramids lie along a diagonal line from the northeast towards the southwest, so that the sides of the bases, and the distances that separate them, form consecutive dimensions along two axes, from north to south and from east to west. In this we have the basis of a coherent dimensional scheme, suggesting that the placing of the three Pyramids might be explained by the existence of an underlying ground plan. How might this be tested?

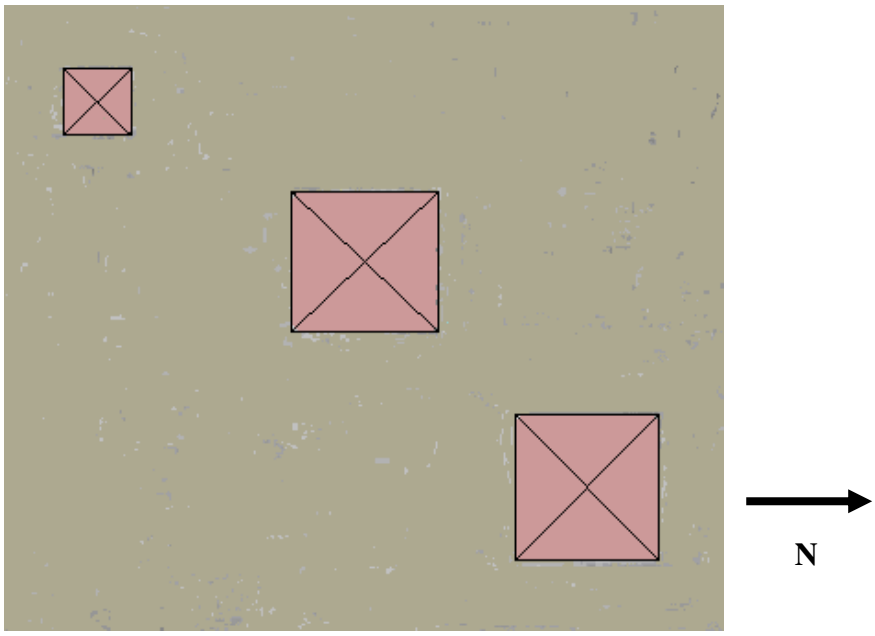

Figure 2: Giza Pyramids Positioning

In the year 1880, a young surveyor from England arrived in Egypt with the intention of making a precise survey of the Great Pyramid. His aim was to establish the accuracy of - although subsequently to disprove - the theory that the dimensions were in effect a revelation expressed in terms of a "Pyramid-inch", corresponding closely to the British unit. Not content to confine his attention to the Great Pyramid alone this surveyor, W.M. Flinders Petrie, extended his triangulation of the plateau to include the Second and Third Pyramids, besides other features; a task that required the fixing of over fifty stations to accuracy within 0.1 inch for the main points. This survey, which laid the foundations for Petrie's long career in Egyptology, also involved numerous excavations to uncover the original bases of the three Pyramids. In his published work, Petrie recorded the dimensions and orientations of the three Pyramids together with the axial distances separating the centers of their bases; also the co-ordinates of survey, from which a full analysis can be made. These dimensions reveal

an underlying plan, remarkable both for its simplicity and the accuracy with which it was laid out. With reference to the Royal Egyptian Cubit, of exactly the value determined by Petrie from measurements in the Great Pyramid - 20.620 inches - the mean distances were set in a horizontal plane within two or three inches of the design, which briefly is as follows:

The Great Pyramid possesses the "π proportion", whereby the height of 280 cubits (1 cubit = 0.52 meter) is to the perimeter of the base of 1760 cubits, as the radius of a circle is to its circumference (for π = 22/7). The sides of the base thus measure 440 cubits, with an adjustment in three sides evidently to give the more accurate mean side 280 xπ/2 = 439.8 cubits.

The dimensions relating the Second Pyramid to the Great Pyramid follow a very simple scheme which was, however, slightly modified to take account of the placing of the Third Pyramid. In this scheme, the north side of the Second Pyramid is set on a line just 250 cubits south from the south side of the Great Pyramid; and the south side of the Second Pyramid, on a line 1.5 x 440 = 660 cubits south from the south side of the Great Pyramid; and hence 2.5 x 440 = 1100 cubits south from the north side of the Pyramid. Similarly along the east-west axis of the plan, the west side of the Second Pyramid is placed 2.5 x 250 = 625 cubits west from the west side of the Great Pyramid. In practice, for reasons given below, one cubit was subtracted from the dimension 625 and added to the dimension 1100, and so the sides of base of the Second Pyramid measure 1101 - 250 - 440 = 411 cubits.

The position of the Third Pyramid defines the overall dimensions of the plan, which are 1417.5 or about 1000√2 cubits from east to west, and 1732 or exactly 1000√3 cubits from north to south. The theoretical dimensions can be obtained by taking firstly, a square of side1000 with diagonals of 1000√2; and secondly, a rectangle measuring 1000 by 1000√2 with diagonals of 1000√3; but the actual dimensions derive from the placing of a scheme of the "circle squared" for the Third Pyramid, relative to the Second Pyramid. This scheme is based on a square of side 500 cubits, which is placed diagonally to the axes of the plan and enclosed within a circle, radius 250√2 or 353.5 cubits. The circumference of the circle, 2220 cubits (for π = 22/7), is now made the perimeter of a second square, centered on the first, with its sides of 555 placed axial to the plan. Along these sides, the points of intersection wit the first square mark off the side of base of the Third Pyramid, 555 - 353.5 = 201.5 cubits. The radius of the circle 353.5 makes the axial distance west from the west side of the

Second Pyramid to the west side of the Third Pyramid. This distance is exactly one-quarter of the nominal overall dimension on the same axis, 1000√2 or 1414 cubits, which became, however, 353.5 + 624 + 440 = 1417.5 cubits. On the north south axis, the line of the south side of the Second Pyramid being tangent to the circle, it is 353.5 + 555/√2 = 631 cubits north from the south side of the Third Pyramid, so that the overall dimension became 631 + 1101 = 1732 or exactly 1000√3 cubits. Thus the adjustment of one cubit between the dimensions 624 and 1101, made both overall dimensions more accurate.

There were other factors involved in the ground plan as indicated by the approximate alignment of the North West corner of the Great Pyramid with the South West corners of the Second and Third Pyramids. In addition, the Third Pyramid has nearly 113° CW rotation relative to the axes of the plan, introducing whole numbers of tens of cubits in dimensions northwards from both the North East and North West comers, which would otherwise have been greater or less by 0.5 cubits.

1 Outline of the Contest

Robo-Pharaohs Build Pyramids is the main theme of this contest. The idea is based on a virtual time machine that takes ancient Egyptian Great-Pyramids builders inside classrooms of technical schools. The new target is to build parts of the three Pyramids in sequence. Competing team members should be accurate, fast and cooperative. They should adhere to the main requirement of not using binding material between blocks. The winner team is the "Robo-Pharaoh" which succeeds to finish building assigned parts of the three Pyramids first. During three minutes, red and blue teams compete in order to mimic one of the surviving Seven World Wonders.

2 Game Field Structure and Specifications

2.1. The game field is shown in Figure 3 (Figures 3 to 12 are at the end of this text).

2.2. The game field consists of two Automatic Zones and a Manual Zone and three Pyramids (Khufu, Khafraa and Mankaura). Automatic Zone #1 is the area surrounding Khafraa Pyramid and Automatic Zone #2 is the area surrounding Mankaura Pyramid.

2.3. The shape and dimensions of the game field are shown in Figure 4. A wooden fence of 100 mm height and 30 mm wide surrounds Automatic Zone #1, Automatic Zone #2, and Manual Zones. However, the width of the fence, marked F and G, is 140 mm.

N.B. **Figure 4 does not contain the guiding white lines to focus only on the detailed dimensions.**

2.4. White lines are drawn on the floor of the game field. These white lines are drawn 500 mm center to center, from the center of Khafraa Pyramid and Mankaura Pyramid respectively as shown in Figure 3. Each white line is 50 mm wide.

2.5. Automatic Zones

2.5.1. The Automatic Zones are divided into two exclusive plateaus. Each plateau is divided into two sections, one for the red team and the other for the blue team. A wooden fence, of **100 mm height and 30 mm wide,** separates the two sections.

2.5.2. The Automatic Zones (1st Plateau: Khufu and Khafraa Pyramids) contain four Start Zones and two Stock Zones for the automatic units; namely (RA1, RA2, SRA1/2) for the red team and (BA1, BA2, SBA1/2) for the blue team.

2.5.3. The Automatic Zones (2nd Plateau: Mankaura Pyramid) contains two Start Zones and two Stock Zones for the automatic units: (RA3, SRA3) for the red team and (BA3, SBA3) for the blue team. Each team is free to decide how to arrange the blocks in its stock zones.

2.5.4. Start Zones

2.5.4.1. The dimensions of the Start Zones are shown in Figure 4.

2.5.4.2. The floor surface is red with RGB (255, 0, 0) for the red team and blue RGB (0, 0, 255) for the blue team.

2.5.4.3. The floor surface of the start zone is considered as part of automatic zones.

2.5.5. Stock Zones

2.5.5.1. The dimensions of the Stock Zones are shown in Figure 4.

2.5.5.2. The floor surface is red with RGB (255, 0, 0) for the red team and blue RGB (0, 0, 255) for the blue team.

2.5.5.3. The floor surface of the stock zones is considered as part of automatic zones.

2.5.5.4. The stock zones has respectively for each team:

- (seven+2=9) blocks for Khafraa
- (one+1=2) blocks for Mankaura
- (one top+1=2) Golden blocks for each Pyramid.

2.5.5.5. Each team decides the arrangement of the blocks left in the Stock Zone once they preload some blocks on their robots.

2.5.6. Automatic Zones Colors: The field surface color is green with RGB (0, 255, 0) with white lines of 50 mm width.

2.6. Manual Zone

2.6.1. The field surface color has an RGB (255,192,192) for the red team and has an RGB (192,192, 255) for the blue team

2.6.2. Start Zones

2.6.2.1. The Start Zone and its dimensions are shown in Figure 3 and Figure 4.

2.6.2.2. The colors of the Starting Area are red with RGB (255, 0, 0) for the red team and blue with RGB (0, 0, 255) for the blue team.

2.6.3. Stock Zones

2.6.3.1. There are two manual stock zones, one for each team.

2.6.3.2. Each stock zone has (seven+2=9) blocks and (one top +1=2) golden blocks.

3 Specifications of the Three Pyramids and Their Bases

Figure 5 shows the completely constructed three Pyramids; Khufu, Khafraa, and Mankaura. The color of all blocks is of RGB (255, 210, 110). The top and bottom surfaces of the blocks, used by the teams, are either Red or Blue. The Top Block of each Pyramid is Gold of RGB (192, 192, 0). The robot bases are shown in Figure 6 (a, b, c). At the middle of all sides of the three bases, a strip of thickness 50 mm with color RGB (186, 91, 6) is fixed.

3.1. Khufu Pyramid

3.1.1. This Pyramid consists of: a base (Figure 6a), 3 middle layers, and a top.

3.1.2. It has 10 prefixed blocks in the 1st middle layer (Figure 7).

3.1.3. It has 3 prefixed blocks on the 2nd middle layer (Figure 7).

3.1.4. It has 2 prefixed blocks on the 3rd middle layer (Figure 7).

3.1.5. Each team uses the Manual Robot to place:

- 3 blocks in the 1st middle layer.
- 3 blocks in the 2nd middle layer.
- One block in the 3rd middle layer.
- The top Golden block.

3.2. Khafraa Pyramid

3.2.1. This Pyramid consists of: a base (Figure 6b), 3 middle layers, and a top.

3.2.2. It has 10 prefixed blocks in the 1st middle layer (Figure 7).

3.2.3. It has 3 prefixed blocks in the 2nd middle layer (Figure 7).

3.2.4. It has 2 prefixed blocks in the 3rd middle layer (Figure 7).

3.2.5. Each team may use one or two Automatic Robots (A1, A2) to place:

- 3 blocks in the 1st middle layer.
- 3 blocks in the 2nd middle layer
- One block in the 3rd middle layer
- The top Golden block.

3.3 Mankaura Pyramid

3.3.1 This Pyramid consists of: a base (Figure 6c), one middle layer, and a top.

3.3.2 It has two prefixed blocks in its middle layer (Figure 7).

3.3.3 Each team uses only one Automatic Robot (A3) to place:

- One block in the middle layer.
- The top Golden block.

3.4 The areas that both teams are allowed to move within are separated by a diagonal fence of 30 mm thickness passing through the Pyramids. Each team is not allowed to cross the diagonal line passing through the Pyramids

and enter the area of the other team including the space above the opponent's area except for placing the Golden Block.

3.5 A general view of the competition Game Field of the Giza Pyramids is shown in Figure 8.

4 Specifications of the Pyramids Blocks

4.1. Organizers shall provide samples of prefixed Pyramids' blocks whose specifications are given in Figure 9 with RGB (255, 210, 110) of all sides.

4.2. Guidance rigid bars of 18 mm diameter are fixed in the base (Figure 6) with the appropriate heights (300 mm, 600 mm, and 900 mm). The blocks are assembled through the holes in these bars (Figure 7).

4.3. Organizer shall fix the required axe for the Top Golden block on top of all prefixed blocks. Its specifications are given in Figure 10. The bottom plate of the guidance pin (2 mm Thickness) may be of steel and can be welded and/or glued to the prefixed blocks.

4.4. Organizers shall prepare necessary building blocks to be used by the robots with the specifications given in Figure 11.

4.5. The Top Golden block is provided by the organizer (Figure 11).

4.6. All blocks are similar in dimensions and weight.

4.7. The blocks are made of foam polystyrene. Each block weighs 750 gm approximately. The organizer shall provide a sample of the building block.

5 Game Procedure

5.1. Each match lasts 3 minutes.

5.2. Each match is divided into three phases.

5.3. A manual unit can be preloaded (before game start) with 4 blocks at maximum.

5.4. An automatic unit can be preloaded (before game start) with any arbitrary number of blocks.

5.5. Each phase is dedicated to build a Pyramid.

5.6. Only one manual unit should be used.

5.7. The number of automatic units should be one to three units.

5.8. The first phase is to build parts in Khufu Pyramid by the Manual Robot only. The second phase is to build parts in Khafraa Pyramid by one or two Automatic Robots. The third phase is to build parts in Mankaura Pyramid by one Automatic Robot. The following Table shows the three phases and assigned durations.

	Phase 1	**Phase 2**	**Phase 3**
Pyramid	**Khufu**	**Khafraa**	**Mankaura**
Duration (Seconds)	**90**	**60**	**30**

5.9. Each phase ends in the following cases:

5.9.1. A team places the Top Golden block after constructing the underneath layers. In this case, the other team should stop the task of the current phase. The two teams move to the next phase with the remaining time added to the next phase.

5.9.2. Phase duration will be elapsed and announced by a beep

5.9.3. If a phase ends before the specified time, a referee should raise a flag with a special beep to announce ending of this phase.

5.9.4. The next phase will be started by its normal beep according to 5.9.2.

5.9.5. For the Manual Robot: if a team well places a complete layer, the referee shall enable this team to start building the next layer by raising a flag. Otherwise, building the next layer is not permitted.

5.10. A beep announces the end of a phase and the start of the next phase if any.

5.11. A Pyramid is expected to be built layer after another. It is not permitted to place a block on any upper layer before laying down all the blocks of the lower layers in their correct positions. For Khufu Pyramid, this will be judged by referees who raise a flag. For the other two Pyramids, each team points will be calculated by the end of the match.

5.12. Setting of robots

5.12.1. Two minutes are provided for setting of all robots before the start of each match. This includes preloading and arranging blocks in the stock zone.

5.12.2. Three members of each team may engage in setting of robots.

5.12.3. A team who fails to complete setting of robots in two minutes shall be able to resume the setting work once the match has begun.

5.13. During a Match

5.13.1. One team member is responsible of starting and operating the Manual Robot.

5.13.2. The operator of the Manual Robot should move freely in the Manual Area with a controller in the hands during building Khufu.

5.13.3. The operator of the Manual Robot should leave the Game Area after turning-off and parking the Manual Robot anywhere in the Manual zone.

5.13.4. If two Automatic Robots are used (For Khafraa construction), they should be started manually at or after the assigned start timing to build Khafraa (the Second Pyramid).

5.13.5. If two Automatic Robots are used (For Khafraa construction), they should power-off manually at or slightly after the ending beep.

5.13.6. After switching the robot on, the team member who performs the starting operation shall immediately leave the Game Field.

5.13.7. The Automatic Robot, that builds Mankaura Pyramid, can be loaded and started manually or autonomously.

5.14. Correct positioning of blocks (see Fig. 12) in different layers will be judged by the referees according to the following:

5.14.1. For all layers, the maximum allowable tolerance is 25 mm in the horizontal plane. No tolerance is allowed in any other plane.

5.14.2. For a normal block: in case of exceeding the maximum allowable tolerance, no points will be given.

5.14.3. For the Top Golden Block: in case of exceeding the maximum allowable tolerance, only 50% of its assigned points will be given.

5.14.4. No points will be given to any non-horizontal block, including the Top Golden Block.

6 Retries of Robots

6.1. In the case of faulty Automatic Robot movements, it is possible to start again (Retry) with the referees permission.

6.2. Team members are permitted to move a Robot to its start zone while preparing for a Retry.

6.3. It is not permitted to load an Automatic Robot with any new blocks.

6.4. At the time of the Retry, team members shall switch the robot on to start it. After switching the robot on, the team member who performs the starting operation shall immediately leave the Game Field.

6.5. Retries can be made as many times as necessary.

6.6. Strategies premised on the use of Retries are banned.

7 Deciding the Winner

7.1. The team who places the three Golden Top Blocks of the three Pyramids in the correct directions first is the winner. This terminates immediately the game if all blocks are in their correct positions and/or within the allowed tolerance. This typical winner will be declared as **Robo-Pharaoh** (Figure 12).

7.2. If neither team has placed the three Golden Top Blocks of the three Pyramids at the end of the 3 minutes match, the winner shall be whoever has more points than the other according to the following:

7.2.1. Khufu Pyramid (22 points)

- 1 point for a block in the 1st middle layer.
- 2 points for a block in the 2nd middle layer.
- 3 points for a block in the 3rd middle layer.
- 10 points for the Golden Top Block.

7.2.2. Khafraa Pyramid (44 points)

- 2 points for a block in the 1st middle layer.
- 4 points for a block in the 2nd middle layer.
- 6 points for a block in the 3rd middle layer.
- 20 points for the Golden Top Block.

7.2.3. Mankaura Pyramid (12 points)

- 2 points for a block in the middle layer
- 10 points for the Golden Top Block.

7.3. The match result will be announced at the end of the 3 minutes as follows:

- The total number of points (score) gained by each team will be announced after deduction of any violation acts.
- The team declared ***"Robo-Pharaoh"*** will be attributed 30 points over i.e. of a maximum score of`**108 points**.
- The winner is the team having the higher score.

8 Design and Manufacturing Robots (Conditions and Remarks)

8.1. Each team should use **one Manual Robot** and **1 to 3 Automatic Robots**.

8.2. The robots must not be divided into sub-units.

8.3. Communication between the Automatic Robots is allowed.

8.4. The robots used in the contest must be made by students of the university to which the team belongs.

8.5. Automatic Robots

8.5.1. The Automatic Robots shall move automatically once it has been started within one phase.

8.5.2. At the beginning of the game, in the start zone, the dimensions of the Automatic Robot including the preloaded blocks should not exceed 1,000 mm (long) x 1,000 mm (wide) x 1,500 mm (height). There is no size limitation after starting the game.

8.6. Manual Robot

8.6.1. The Manual Robot can be operated by means of a cable connection or by remote control using infrared, visible rays or sound waves. Wireless radio control is not permitted. The operator is not permitted to ride on the Manual Robot.

8.6.2. In the case of cable operation, the cable connecting the Manual Robot and the controller shall be at least 1,000 mm and not more than 3,000 mm long. The cable shall be connected to the robot at a height of not less than 1,000 mm above the floor surface of the Field.

8.6.3. The dimensions of the Manual Robot shall not exceed 1,000 mm (long) x 1,000 mm (wide) x 1,500 mm (height) in the start zone. A

robot shall be capable of stretching its arms and other parts within the range delimited by a circle that is 2,000 mm in diameter as viewed from above.

8.7. Weight of the robots**:** The combined weight of all of a team's robots and other devices to be used in the entire contest, including the power source, cables, controllers, and other equipment, shall not exceed 50 kg. The weight of back-up batteries of the same type, weight and voltage as the primary batteries is, however, exempted from this rule.

8.8. Power sources for the robots

8.8.1. Each team must prepare the power sources for the robots.

8.8.2. The voltage of the power source used by each robot shall not exceed DC24V.

8.8.3. Any power source deemed dangerous or inappropriate by the organizer may not be used.

8.9. Detailed rules of safety

8.9.1. The use of explosives, fire and dangerous chemicals is prohibited.

8.9.2. If a laser is used, it shall be of Class 2 or less. In designing and preparing the laser, 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.

8.10. Participating robots will be checked and tested, according to this rule book, the day before the contest. They will be checked again before starting the matches. Passing this check test is a necessary condition to allow the robot to participate in the contest. In the other case, the robot will not participate in the contest.

9 Violations

If a violation occurs, two points will be deducted as a result of such violation. The following cases are considered violations:

9.1. Intentional obstruction over the top plate is not permitted.

9.2. Any part of either the robot or its operator enters onto the zone of the opposing team or into the space above it except while placing the Gold Top Block.

9.3. Manual Robot shall not enter the Automatic Zone and the space above it except while placing blocks on the Khufu Pyramid.

9.4. Other actions that infringe on the rules without producing disqualification.

10 Disqualification

A team shall be disqualified if it commits any of the following during the match:

10.1. The team damages or tries to damage the Game Field, and/or facilities and equipment of opponent's robots.

10.2. Either the teams' robots or their operators cross the outer boundary of their Game Field on ground or in air.

10.3. The team has made a false start twice in the same match.

10.4. The team performs any act that is not in the spirit of fair play.

10.5. The team fails to obey instructions and/or warnings issued by the referees.

10.6. Three violations are considered as disqualifications

11 Safety of Robots

11.1. All robots must be so designed and manufactured as to pose no danger of any kind to any person in the venue.

11.2. All robots must be so designed and manufactured as to cause no damage to any robot of an opposing team or the Game Field.

12 Teams

12.1. Each participating country or region in the contest can be represented by only one team. Egypt, as host country, may be represented by two teams.

12.2. A team consists of three undergraduate students and one instructor who all belong to the same university. The three students of the team are entitled to participate in the match itself.

12.3. In addition, a three-member pit crew can adjust the robots in the pit room and help to carry the robots to the Game Field, but cannot participate in the match itself. The members of the pit crew must be undergraduate students of the same university as the main team.

12.4. Participation by post-graduate students (graduate school students) is not permitted.

13 Others

13.1. The legitimacy of any action not provided in this rule book shall be subject to discretion of the referees.

13.2. The dimensions and weights of the Game Field, equipment and other facilities described in this rule book have a margin of a maximum tolerance of ± 5% unless otherwise stated.

13.3. All questions should be addressed to the official website of the ABU Asia-Pacific Robot Contest 2010 Cairo (http://www.roboconegypt2010.com). FAQ section will be provided on the site.

13.4. Notification of any addition and/or correction to this rule book shall be made on the official web site.

13.5. The referees may demand additional explanations on safety issues when the safety of a robot is deemed to be in question.

13.6. No contact, by means of radio communication devices and/or loudspeakers, is permitted between team members themselves and/or any third party during a match.