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Town Watch(Mobile)	League	Participation	Construction
	Junior/ Challenge	1 Person	1 Robot

1. Game description

Robot must autonomously drive utilizing various sensors in the smart device, carry out missions in a given environment, and aims to develop platforms for the Internet of Things (IoT) and autonomous driving in the future.

2. Robot

2-1. Robot type: Any robot which are compatible with smart device (except camera)

2-2. Built on-site

The robot should be built on-site by the participant during the construction time except for the robot controller. Must obey size standard and must be able to be measured at the measuring instrument.

2-2-1. Size of robot

2-2-1-1. Size: Robot should be less than 18cm X 22cm (H*W)

2-2-1-2. League divided

- 1) A league using Smart Phone to recognize the color (Mobile league)
- 2) A league using non-smart phone such as color sensor or camera to recognize the color (Overall league)

2-2-1-3. Size measurement

- 1) Self-Check: Participant can check size of the robot while manufacturing and practicing.
- 2) Official inspection: Before the competition, referee will check the size of the robot.
- 3) Ways of Measuring: Referee will check the size of the robot with the measuring materials. Participant cannot give any objection toward the judge.

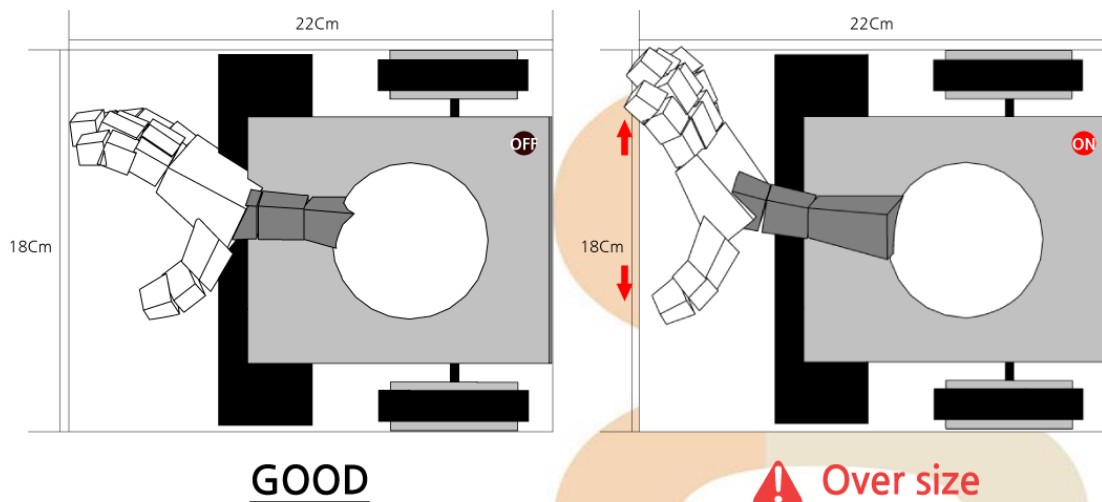
- 4) Modify: If it exceeds the size, participant has a minute to modify their robot in front of the judge. participant will be given 1 minute to modify their

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robot in front of the judge, on a designated desk. If participant fails to fit the standard size, he or she will be disqualified.

5) If size of the robot is different when the actual match begins, will be disqualified too.



*When Length and weigh is changed, same rule applies.

2-2-2. Sensor of the Robot: Must use functions in the smart devices to recognize movement and target of robot and destination.

2-2-2-1. Use of camera in the smart device

Townwatch(mobile) is a game designed to perform mission using smartphone camera to distinguish target and line color. Therefore, method of using infrared line to distinguish black and white is inappropriate, points will not be accepted.

2-2-2-2. Other sensors.

Any sorts of infrared line or ultrasonic wave to progress mission are not allowed.

2-2-3. Power

2-2-3-1. Robots should work with an independent electric power supply; it cannot use a combustible device.

2-2-3-2. There is no limitation on type of battery or voltage.

2-2-4. Operation: No restricti

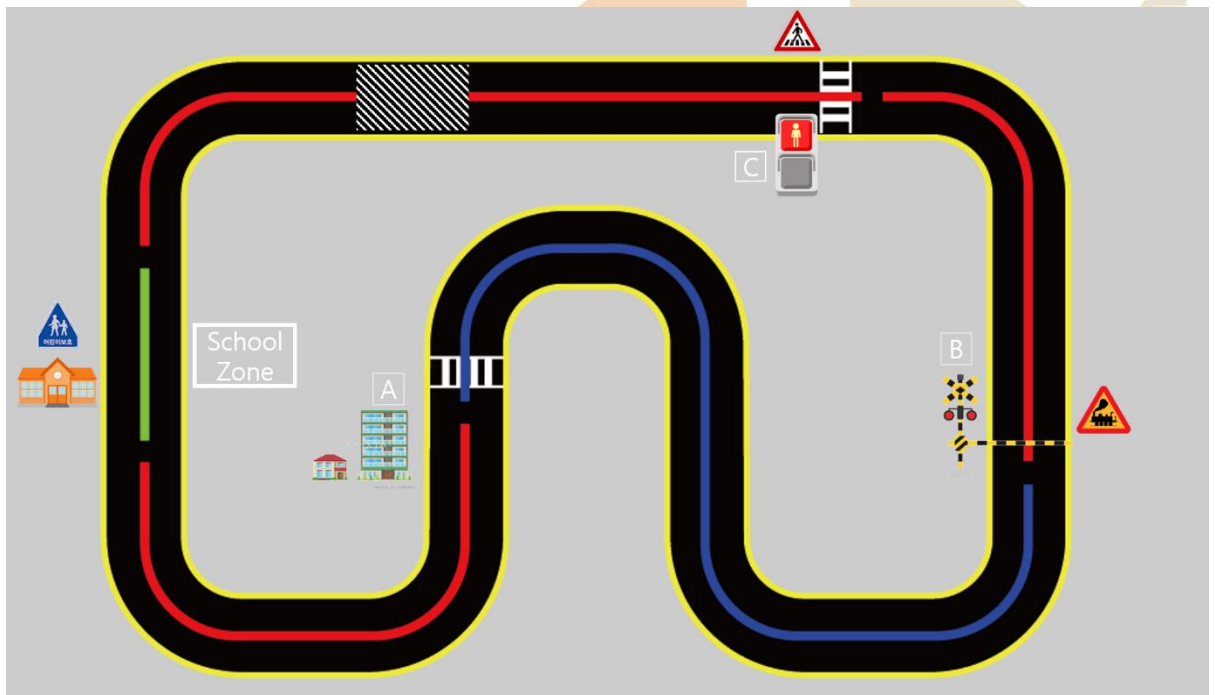
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2-3. Robot must move autonomously by the program except the starting point and it cannot be operated from outside.

3. Competition Site

3-1. Competition site: Playfield approved by International Robot Olympiad committee.



3-2. Size and Composition: The size of playfield has to be **160cm X 240 cm** ($\pm 10\%$).

3-2-1. Mission circuit: Mission line will be 2cm thick and there will be 5 cm disconnection to distinguish the mission.

3-2-2. Allowable range of error in the stadium: Image or prints shown in the playfield may have 10% range of error.

3-2-3. Prevention for falling robot: There will be no special structure for falling robot.

3-3. Playfield: It is cover with matt coat polyethylene terephthalate paper which includes advertisement and logo from the organizers.

3-3-1. Mission Map: It consists of Red, Green and Blue lines and green will be mission line.

3-3-2. Line: The color of line is black and its width is 2cm ($\pm 10\%$)

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3-3-3. Installation of measuring instrument: In order to measure the time, measuring instrument will be installed at starting point and ending point, direction can be changed according to the mission.

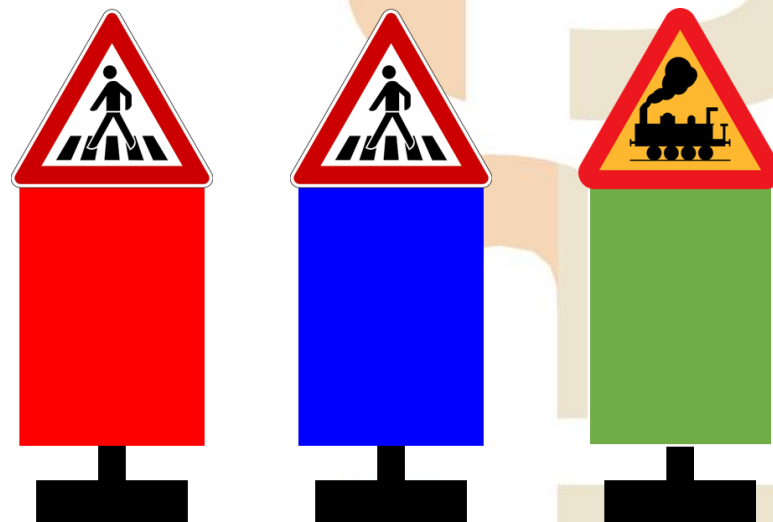
3-4. Mission Indication The sign for recognizing the stadium mission is fixed at an angle of 45° to the right of the robot's driving direction, and each mission has sensors and robots to recognize the robot's arrival.

3-4-1. School zone: Compared to other mission areas, there is no separate sign and the driving line is green.

3-4-2. Area A: blue mission mark will be installed in the crosswalk area where without traffic lights and only crosswalks (white) will be displayed on the floor.

3-4-3. Area B: black mission mark will be installed in the railroad; a yellow and black blocking bar will be installed.

3-4-4. Area C: A red mission marking the crossing will be installed, and actual red and green traffic lights will be installed on the left.



<25cm x 10cm Mission Display>

3-4-5. Start/Arrival: Stickers indicating departure and arrival shall be attached with a sticker (18cm x 22cm) Area will be changed randomly.



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<Start/Arrival Mark>

3-5. Obstacle It will be a fixed object. It can give the physical limitation in the game process.

3-5-1. Railroad(Blocking bar) Once recognizing robot's arrival. Bar comes down and autonomously rises after 5 seconds.

3-5-1. Traffic lights Once recognizing robot's arrival. Traffic lights will change to green after 10 seconds.

3-5-3. Each obstacles can be changed during the game process.

4. Competition progress

4-1. Game process

Chance will be given twice. After first trial there will be repair time.

4-2. Construction and practice time

Construction and practice time will be given more than 2 hours and it will be announced on the matchday.

4-3. Allocation of playfield

It will be allocated based on number of participant and difficulty level of the game.

4-4. Production and Practice time

Participants can practice until the end of announced practice time; however, they're not allowed to practice before their seat's been assigned.

4-5. End of Production and Practice time

After production and practice time, participants must stop their robot and follow the instruction of referee and staffs.

4-6. 1st Trial

After the construction and practice time the 1st trial will begin.

4-6-1. Preparation of the game

All participants must take out the robot and be ready for referee's instruction.

4-6-2. Standby after the game.

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When participant finished their 1st trial, they have to line up and watch all participants' game until end of that trial

4-7. Repair Time

After the end of 1st Trial, all participants have some time to repair their robot and practice. The repair time will be announced on the day of match.

4-8. 2nd Trial

Right after the repair time, 2nd trail will begin.

4-8-1. preparation of the game

All participants must take out the robot and be ready for referee's instruction.

4-8-2. Standby after the game.

If a participant finishes his/her 2nd trial, they will go back to their seats.

5. Competition

5-1. Perform the mission

Driving path and mission order is will be designated but starting/arrival zone will be announced after finishing the coding task.

5-1-1. **School Zone:** It is a slow-moving area that requires driving at less than 50 percent of the actual driving speed. I will be checked by confirming final coding source.

5-1-2. Area A: At the starting point of the area A mission (in the position where the line is disconnected), recognize the mission mark on the right, display mission image in the screen and enter and pass the mission.

5-1-3. Area B: After stopping at the start point of area B mission (in the position where the line is disconnected), recognize the mission mark on the right, display mission image in the screen and enter and pass the mission after the blocking bar rises

5-1-4. Area C: After stopping at the start point of area B mission (in the position where the line is disconnected), recognize the mission mark on the right, display mission image in the screen and enter and pass the mission after confirming traffic lights changes green.

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(Example of mission image)

5-2. Points

A participant gets points on number of success to put targets in the destination. It will be counted as 1 point per 1 target.

5-3. Start A participant should start the robot when the referee starts the game. If robot pass over the measuring instrument, it is considered game start.

5-3-1. Miss Start

If participant couldn't start within 5 counts from referee's signal, it will be declared as 'Miss Start' and they have two more chance to restart for this miss start.

5-3-2. False start

If the participant starts the robot before the referee's signal, it is declared as 'False start' and they have only one more chance to restart.

5-3-3. Restart

The chances are only twice when you are declared as 'miss start' and only once when you are declared as 'False start'. If there is no move after the restart signal from the referee, it will be disqualified.

5-4. Arrival

It will be declared as arrival when robot arrives at the line where measuring instrument or intersection is installed and measuring instrument will stop the time



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recording. (Robot needs to stop at the line or intersection point of measuring instrument)

5-4-1. Arrival mission

The arrival area is the image provided below and is the same location as the starting point



(Image)

5-5. Time limit

3 minutes

5-6. Mission

5-6-1. Location of targets, obstacles and destinations

The location of targets, obstacles and destinations will be announced on the day of match by in form mission paper. Participants can freely practice during practice time

5-6-2. Mission

Mission including the color of targets and destinations will be announced after the practice time right before 1st trial

5-6-3. Mission for 2nd trial

A different mission from the 1st trial will be announced for 2nd trial. Starting and arrival point will be different and will be announced right before 2nd trial.

5-7. End of Competition

5-7-1. Robot arrival

If robot arrives at or passes through the finishing line before time limit where measuring instrument is installed, match is over and points will be recorded when it is finished.

5-7-2. Time limit

If robot couldn't complete the missions within 2 minutes, it will record the points at the end point of the time.

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5-7-3. Robot Stop

If the robot doesn't move, the referee will count 10 seconds and if the robot still could not move, will call it a robot stop and count the points.

5-7-4. TKO (technical knockout): During the match, referee can declare of TKO without 10 counts when referee judge that the robot can't drive properly anymore. (Ex. robot had been stopped over the structure and obstacle, robot drive settled zone repeatedly)

5-7-5. Line Out: If robot is not following the line normally, referee can declare line out without 10 second count.

5-8. Disqualification

Participants can be disqualified if violation is spotted by referee or staff.

5-8-1. Robot Touch

During matches, If participants touch the robot without judge and supervisor authorization, it will be declared as 'Robot Touch' and will be disqualified for that trial.

5-8-2. Repair during the match

During the match, additional, remove, exchange, changing the tool is prohibited, during the standby If the participants has additional battery or tools to repair the robot, the team will be disqualified.

5-8-3. Sensor tuning

Before the competition, if participants try to tune the sensor, then will be disqualified.

5-8-4. Disobey of seat allocation

If participant practice or play the game at the playfield that they're not assigned, participant will be disqualified.

5-8-5. False Start

If participant conduct 'False Start' twice, participants will be disqualified.

5-8-6. Miss Start

If participant conduct 'Miss Start' three times, participants will be disqualified.

5-8-7. Color non-recognition

If robot does not recognize the color of cubes or destination, it will be disqualified.

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(Refer to 2-2-2)

5-9. Rematches

During the match if expected situation occurs, such as blackout or breakdown of measuring instrument, referee can decide to do rematch.

5-10. Match break

5-10-1. If any parts of playfield or structure or appendages has been destroyed because of robot's movement, referee can break the match and repair it. While this repair moment, record time will be stop and robot should be placed where it was stopped.

5-10-2. Referee can stop the match if he/she needs time to make his/her decision of 'Robot stop', 'Robot falls' and to repair playfields. While this repair moment, record time will be stop and robot should be placed where it was stopped. If violated by participant will get a warning from referee.

5-11. Referee will control all situations from and referee have authority to control participants. The judgment of game result is exclusive authorization of referee. The declaration shall be final.

6. Evaluation

6-1. Ranking decision factors

Mission points, time record and stop mission of finishing line.

6-2. Mission points

Points will be judged by the referee in real time during the match.

6-3. Time record

Time record is based on the measuring instruments. (If you are declared as TKO, Robot stop by referee, it will not be recorded.)

6-4. Final score

Better score out of 1st and 2nd trial will be the final score.

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6-5. Order of priority to result

Groups will be divided depending to the mission points and time limit will be next standard. After these criteria, success of stop mission goes second priority to the result.

Number of success object > Time record > School Zone > A > B

6-5-1. Order of priority according to trials

If result is same, winner will be decided after looking at the result of another trials.

6-5-2. Order of priority according to Tie-Breaker

Better score out of 1st and 2nd trial will be accepted as final point, but if tied, player with better result in 1st trial will win the game.