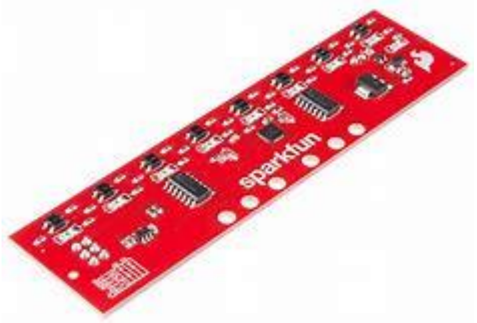
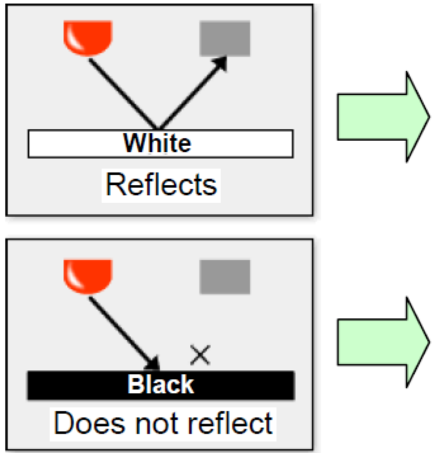
MCR Micro Car Rally

Agenda

- Line follower
- Track
- car

Photo sensor

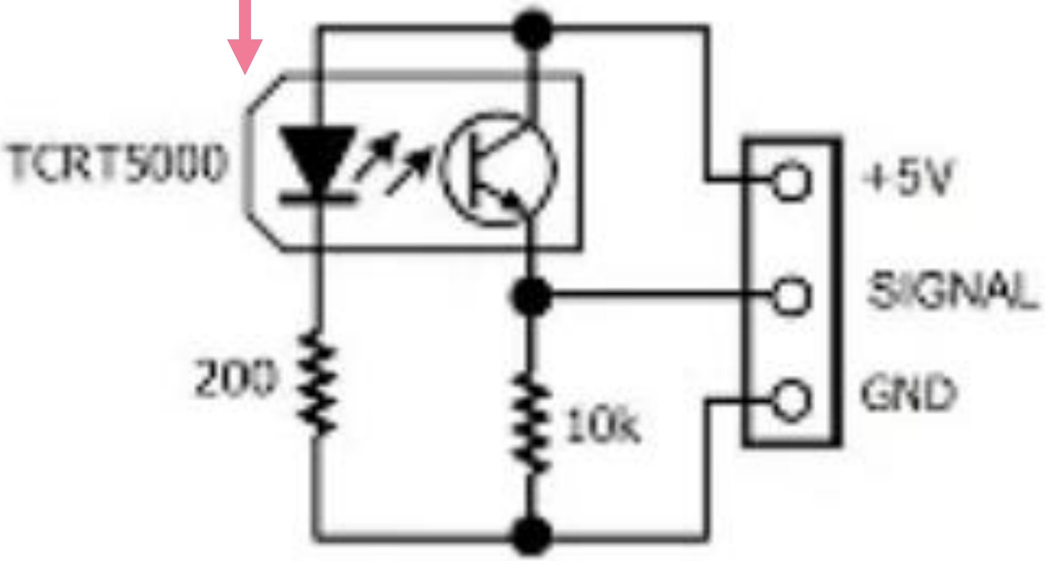


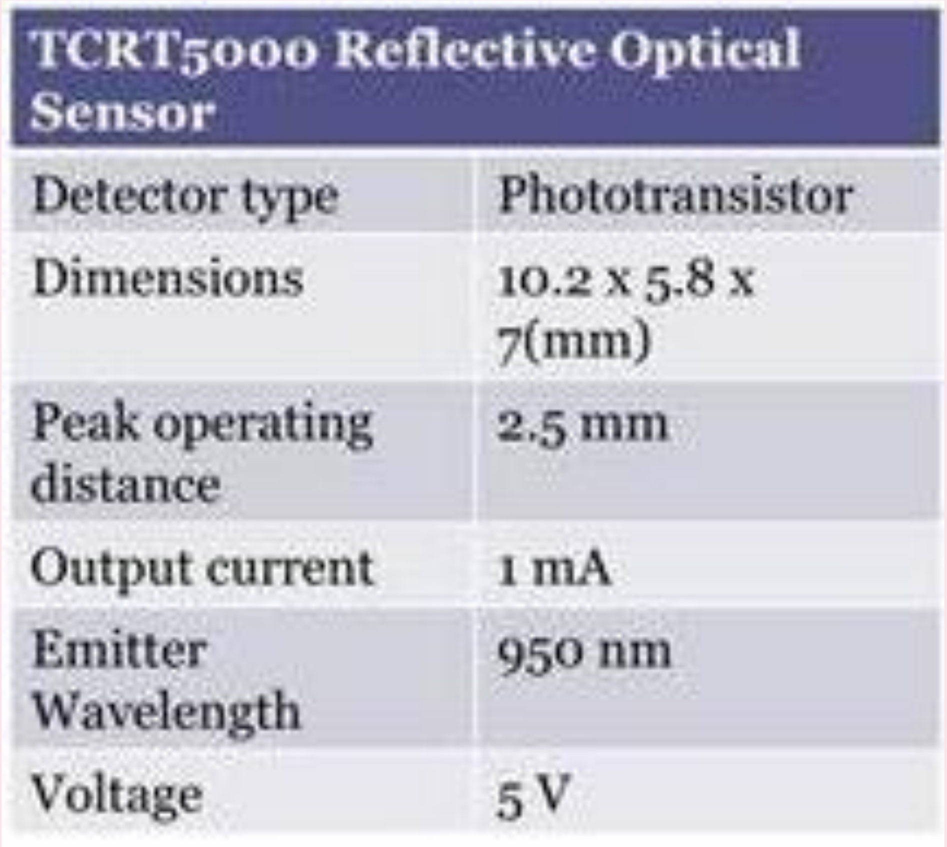


Course determined to be white

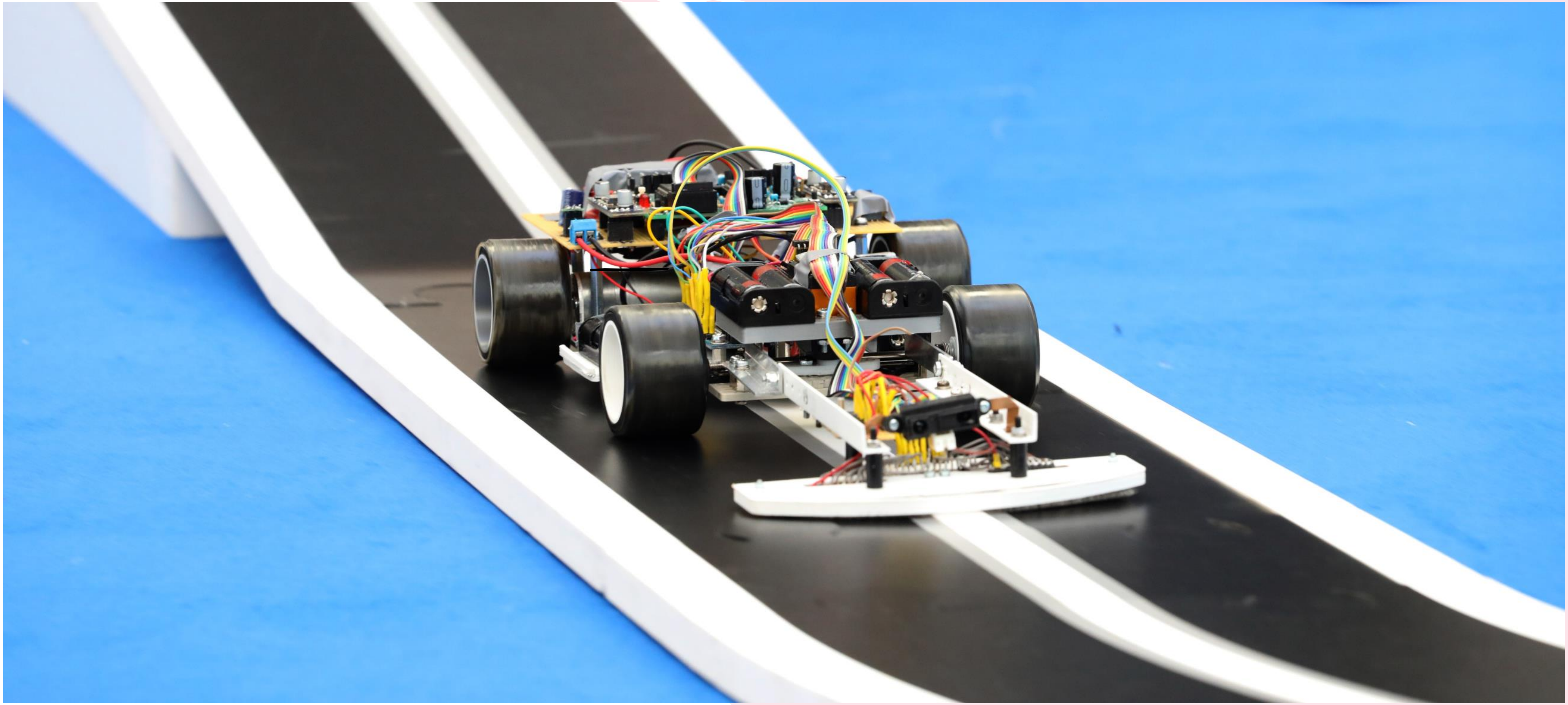
Course determined to be black

notch

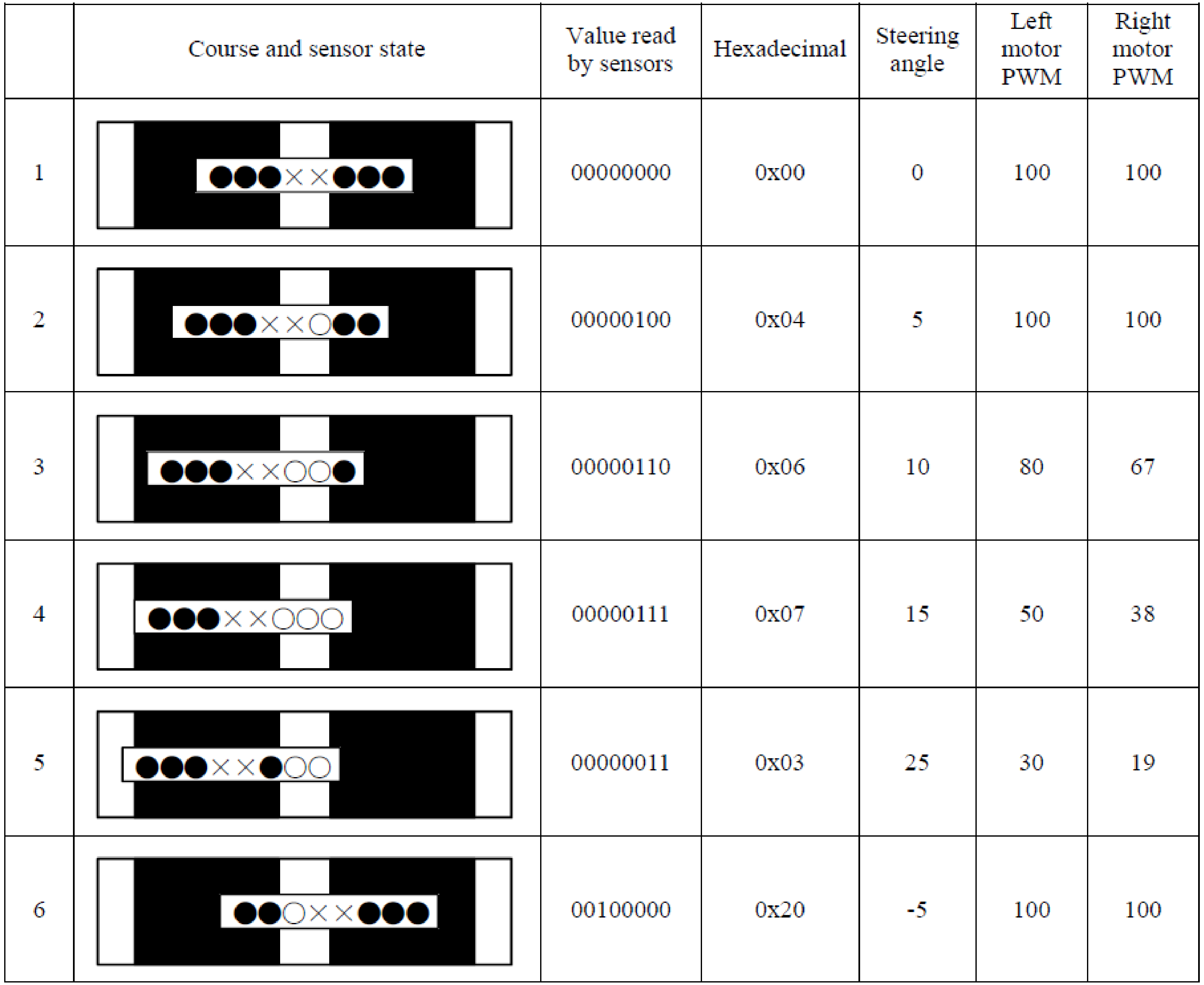




TCRT5000 Reflective Optical Sensor	
Detector type	Phototransistor
Dimensions	10.2 x 5.8 x 7(mm)
Peak operating distance	2.5 mm
Output current	1 mA
Emitter Wavelength	950 nm
Voltage	5 V

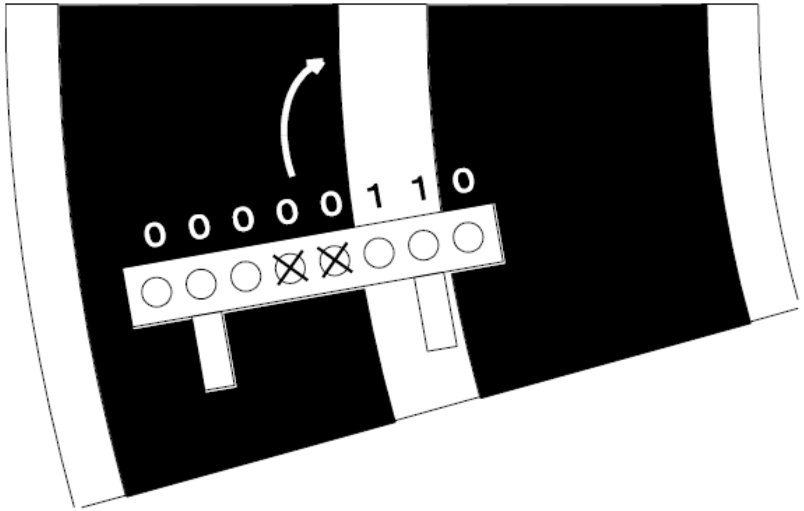


Track pattern

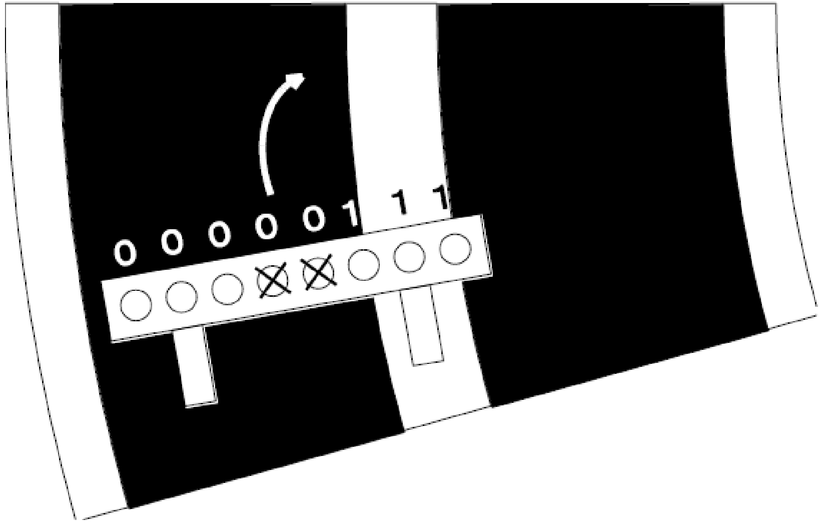


	Course and sensor state	Value read by sensors	Hexadecimal	Steering angle	Left motor PWM	Right motor PWM
1	●●●××●●●	00000000	0x00	0	100	100
2	●●●××○●●	00000100	0x04	5	100	100
3	●●●××○○●	00000110	0x06	10	80	67
4	●●●××○○○	00000111	0x07	15	50	38
5	●●●××●○○	00000011	0x03	25	30	19
6	●●○××●●●	00100000	0x20	-5	100	100

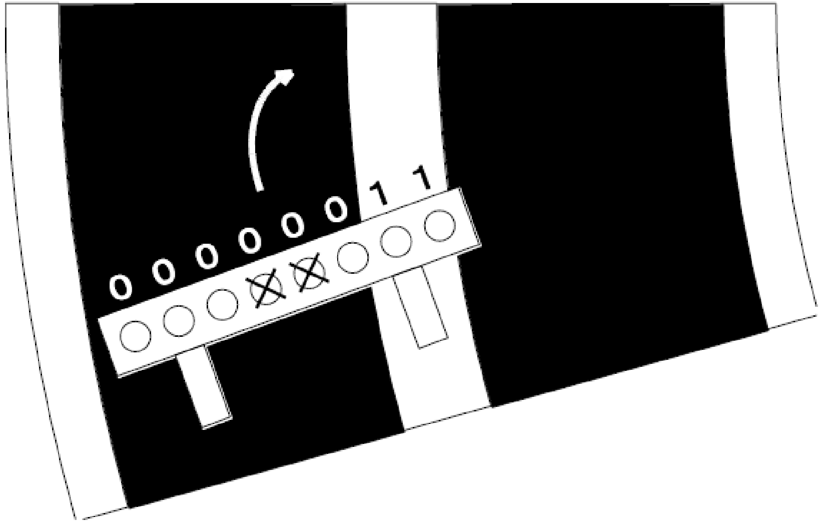
Turns



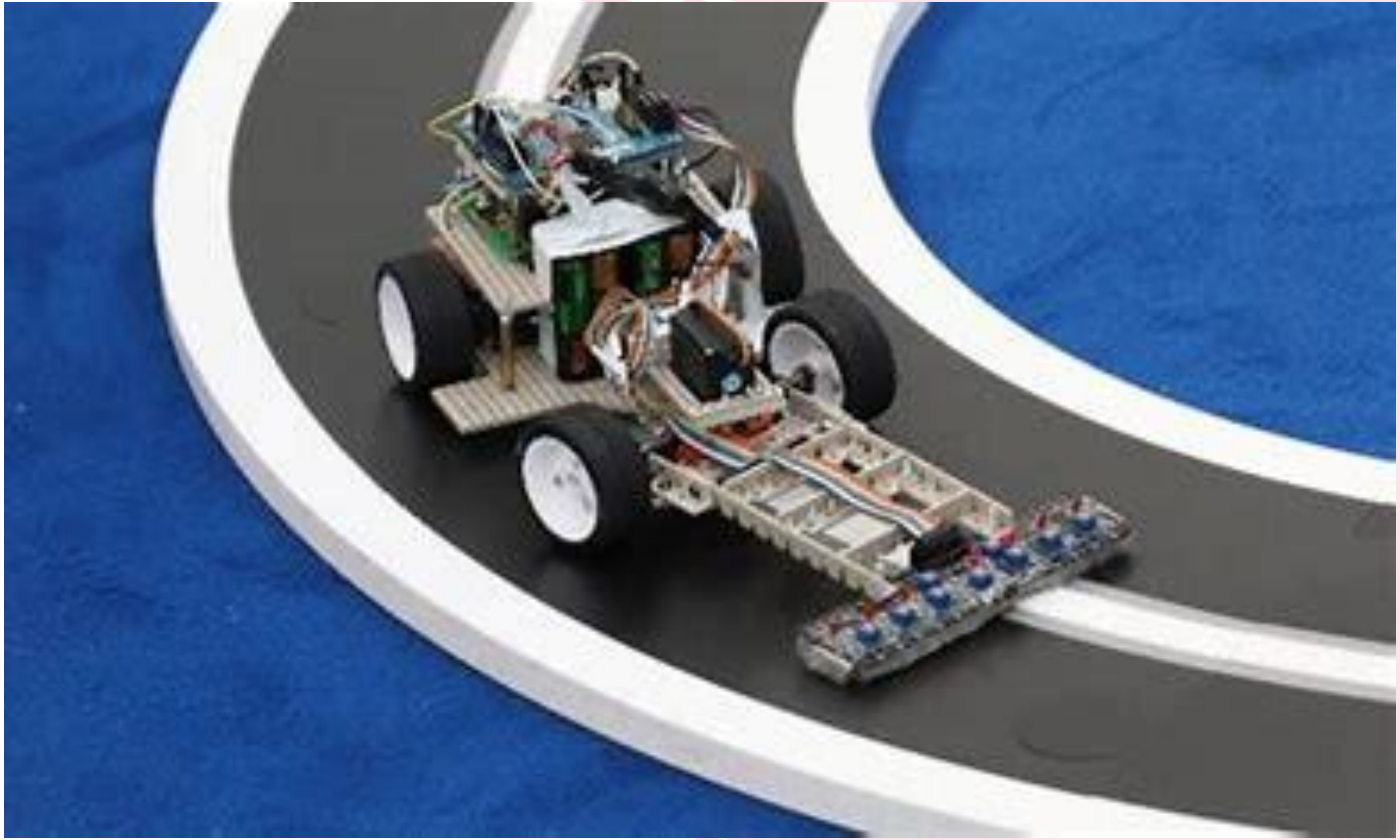
Small Amount Left of Centre



Medium Amount Left of Centre

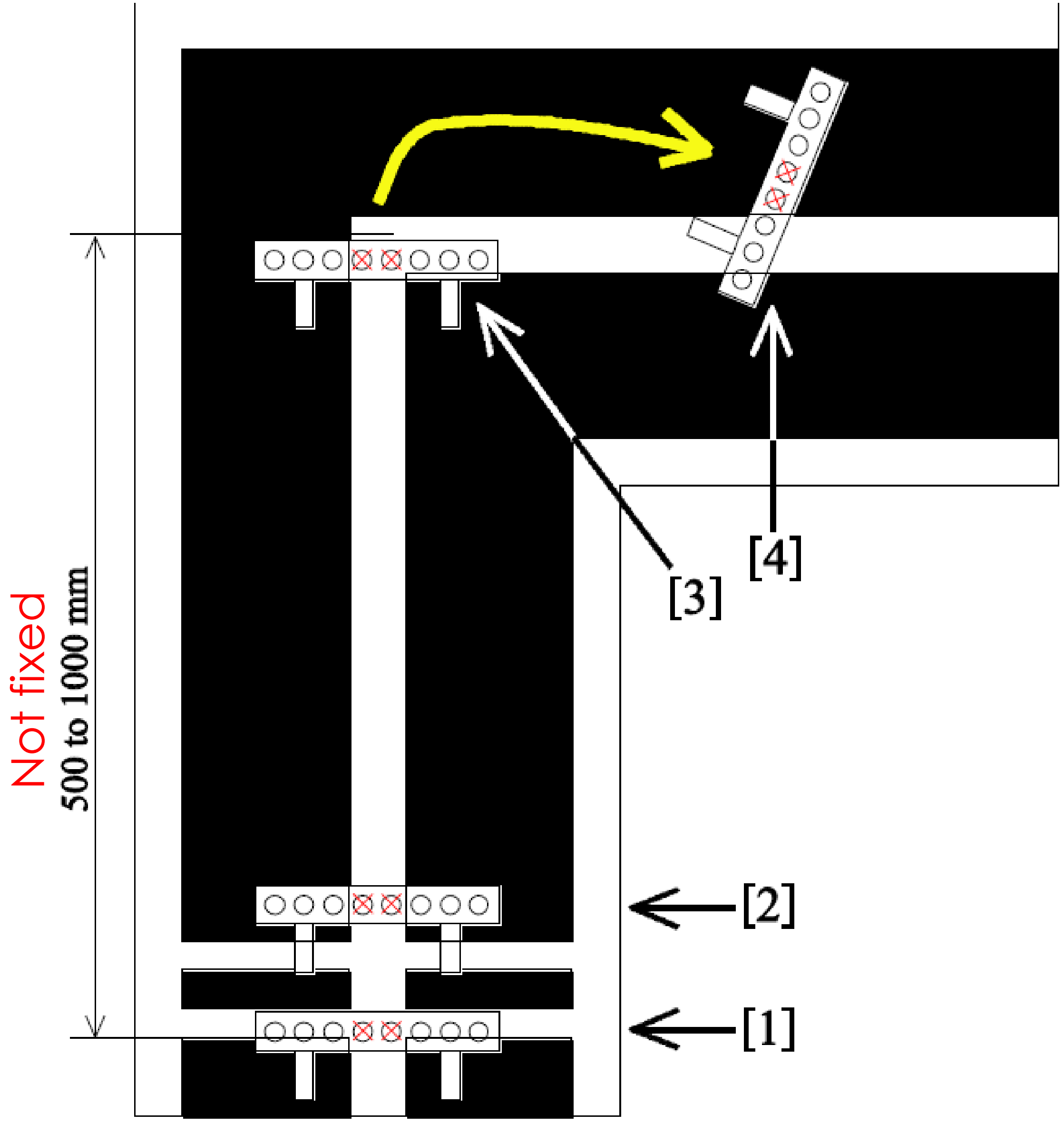


Large Amount Left of Centre

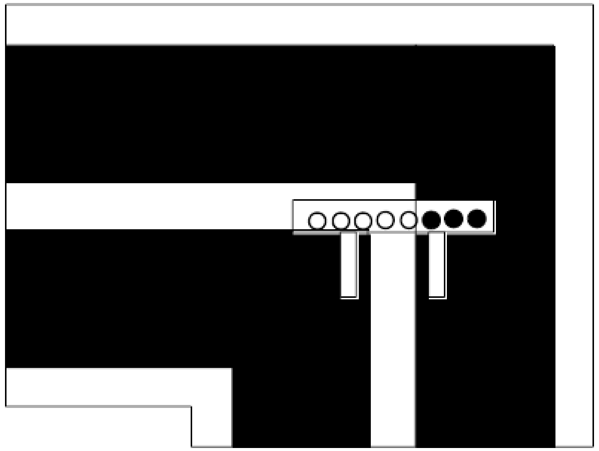


crank

1. The **check_crossline** function detects the presence of crosslines. the MCU car must **apply the brakes** to reduce speed in order to navigate it successfully. In addition, the sensor data is not referenced until position [2] to ensure that the second crossline does not result in detection of erroneous sensor data.
2. This position is the start of the proceed slowly area. The MCU car advances straight ahead along the center line.
3. When the crank is detected, the MCU car turns in the direction of the crank.
4. When the center line is detected, control returns to pattern 11 and line tracing restarts.

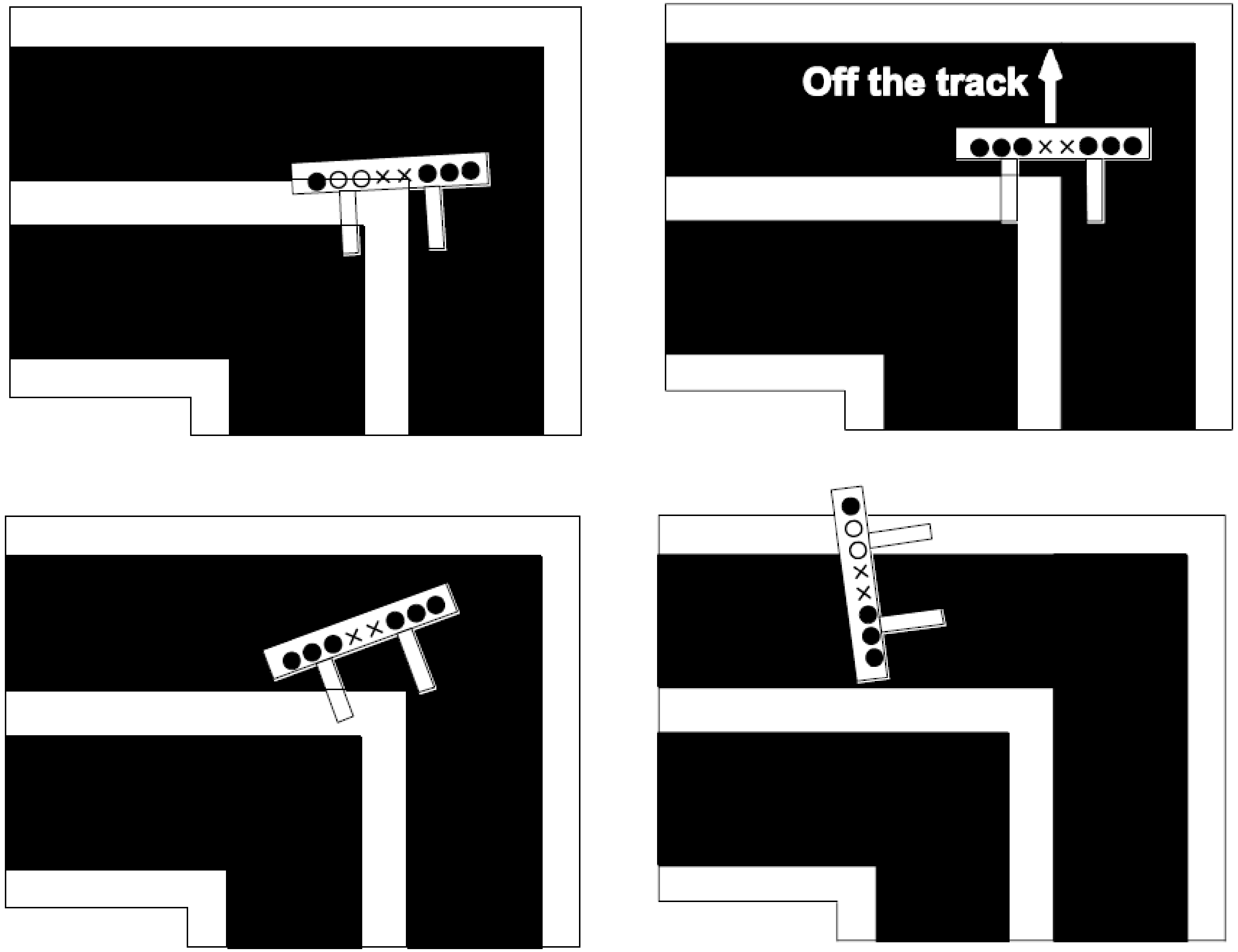


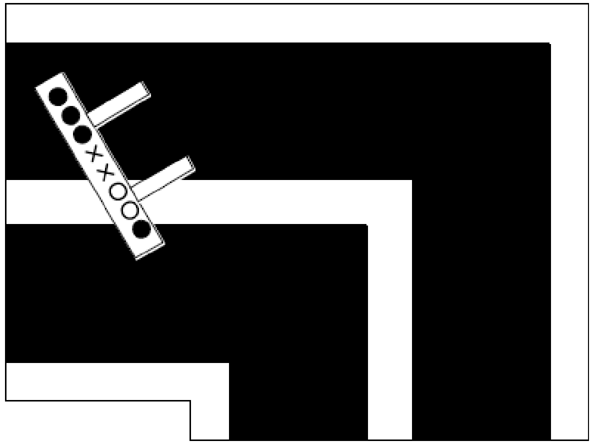
crank



Start turn condition

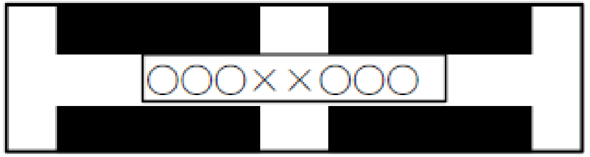
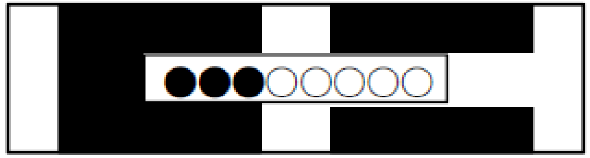
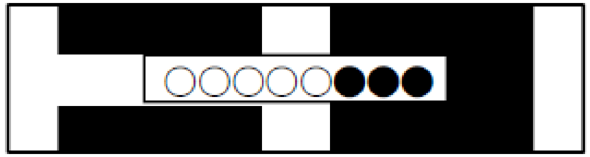
Some cases





end turn condition

Corners and lane exchange

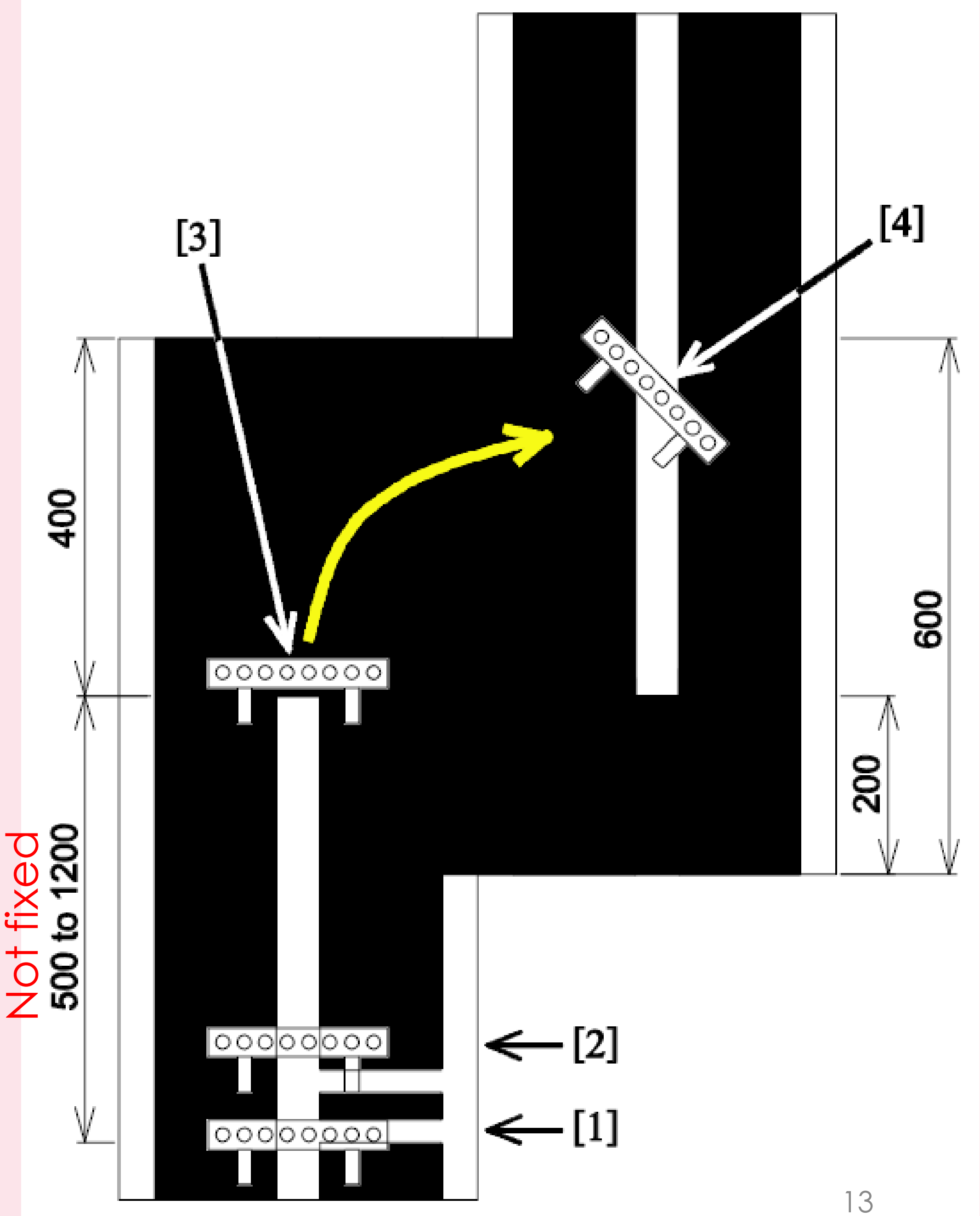
	Course and sensor state	Course feature and processing	Function used for checking
10	 ○○○××○○○ 6 sensors used	Horizontal line (crossline) ↓ When detected, to crank processing (pattern 21)	check_crossline
11	 ●●●○○○○○ 8 sensors used	Horizontal line from centre to right edge only (right half line) ↓ When detected, to right half line processing (pattern 51)	check_rightline
12	 ○○○○○●●● 8 sensors used	Horizontal line from centre to left edge only (left half line) ↓ When detected, to left half line processing (pattern 61)	check_leftline

[1] The **check_rightline** function detects a right half line. brake operation is performed. Also, sensor input is ignored up to position [2] to prevent erroneous sensor detection at the second right half line.

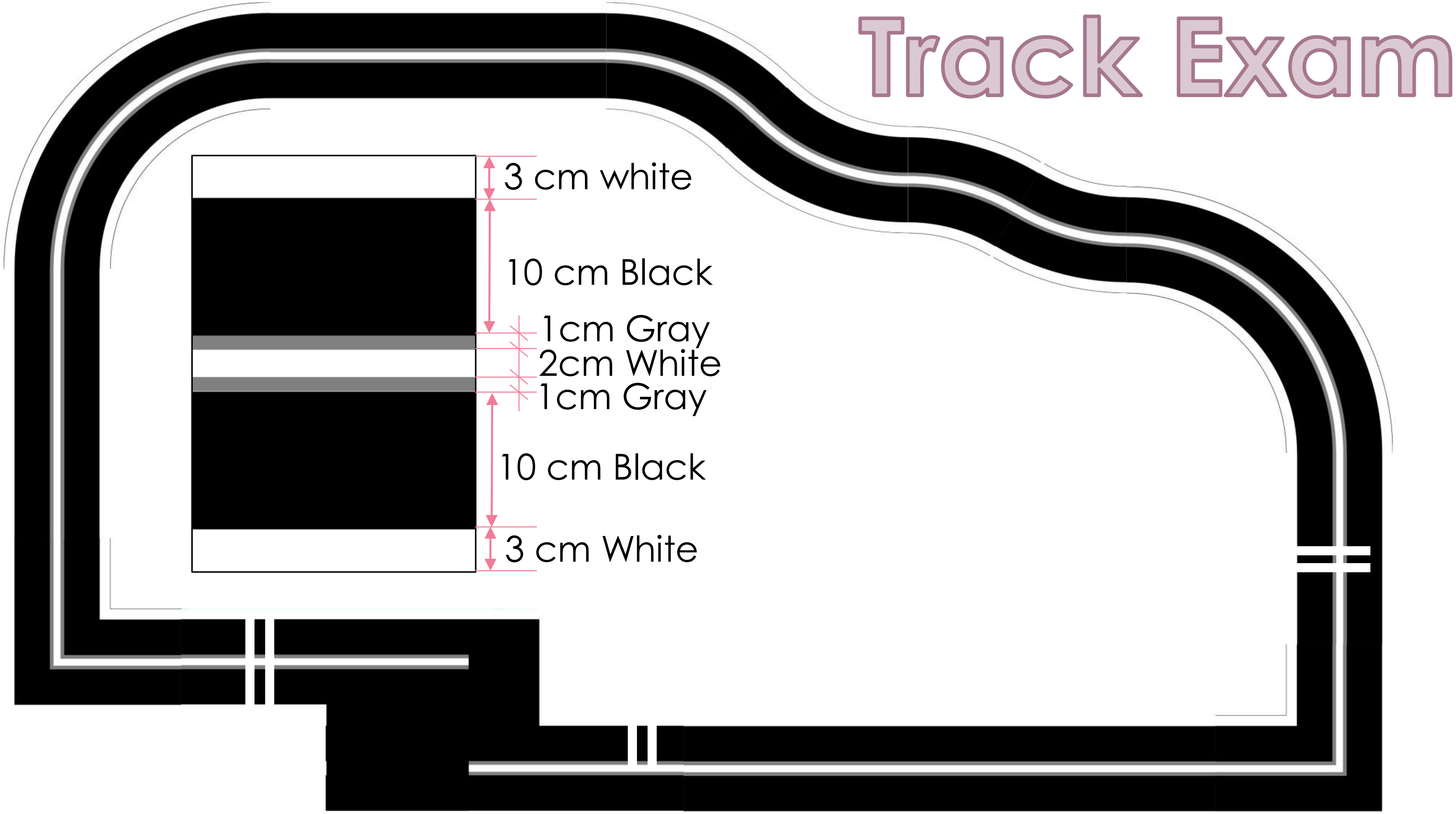
[2] The MCU car starts to proceed slowly from this point. It advances while tracing the center line.

[3] When the center line ends, the steering wheel turns to the right.

[4] When a new center line is detected, line tracing restarts using the new center line.



Track Example



Vehicle Example

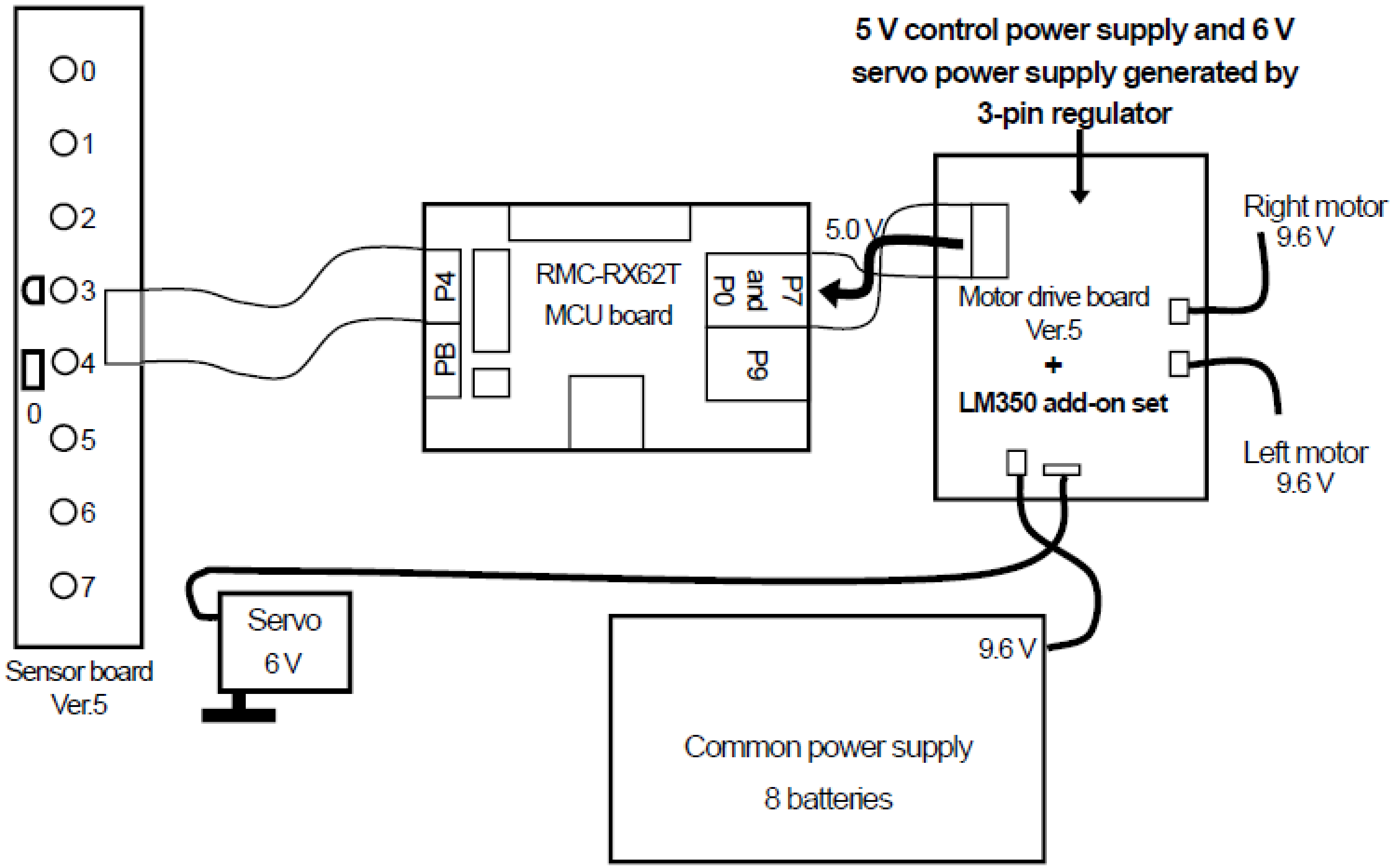
Maximum allowable width 30 cm

Maximum allowable Height 15 cm

JOY RIDE
JOY RIDE

MCU
CAR RALLY
RENESAS
RENESAS
RENESAS

Block diagram


5 V control power supply and 6 V servo power supply generated by 3-pin regulator
0
1
2
3
4
0
5
6
7
Sensor board Ver.5
P4
PB
RMC-RX62T MCU board
P7 and P0
P9
5.0 V
Motor drive board Ver.5
+
LM350 add-on set
Right motor 9.6 V
Left motor 9.6 V
Servo 6 V
9.6 V
Common power supply
8 batteries