Data Sheet

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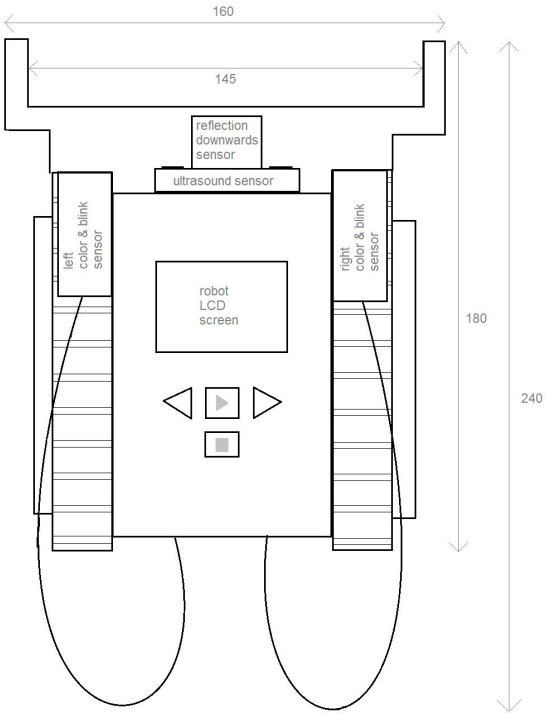
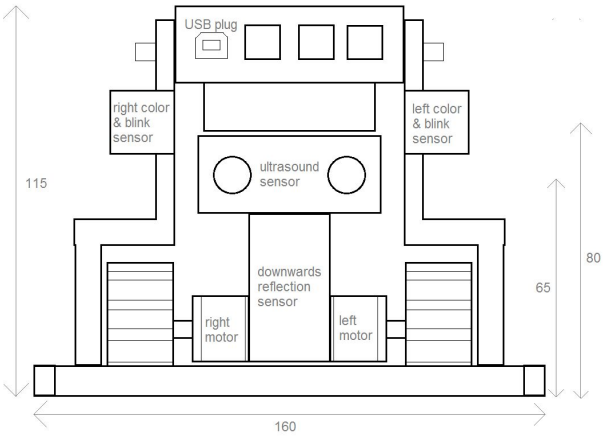
Dimensions:



Top view



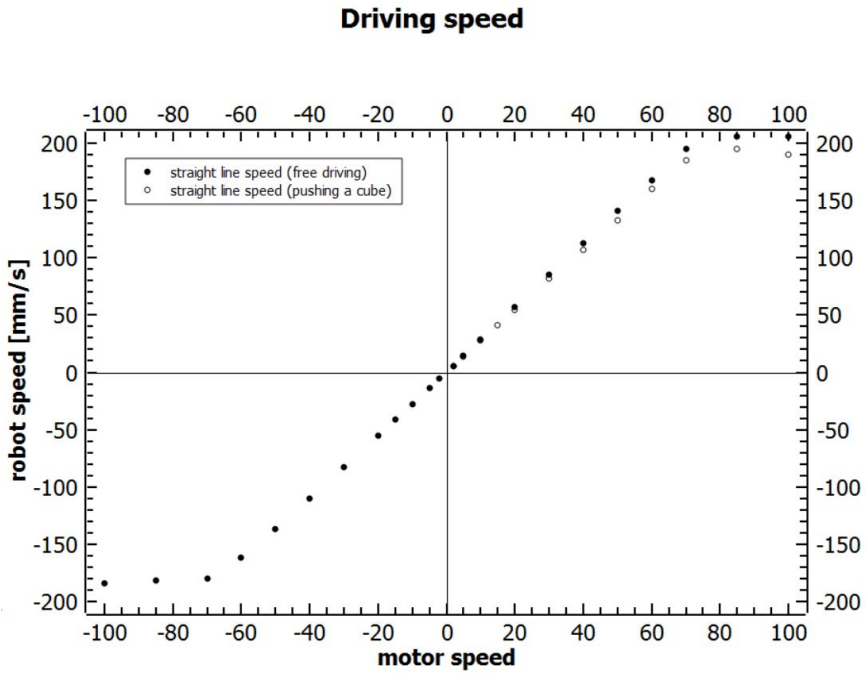
Front view

Weight including batteries: 690 g

Movement:

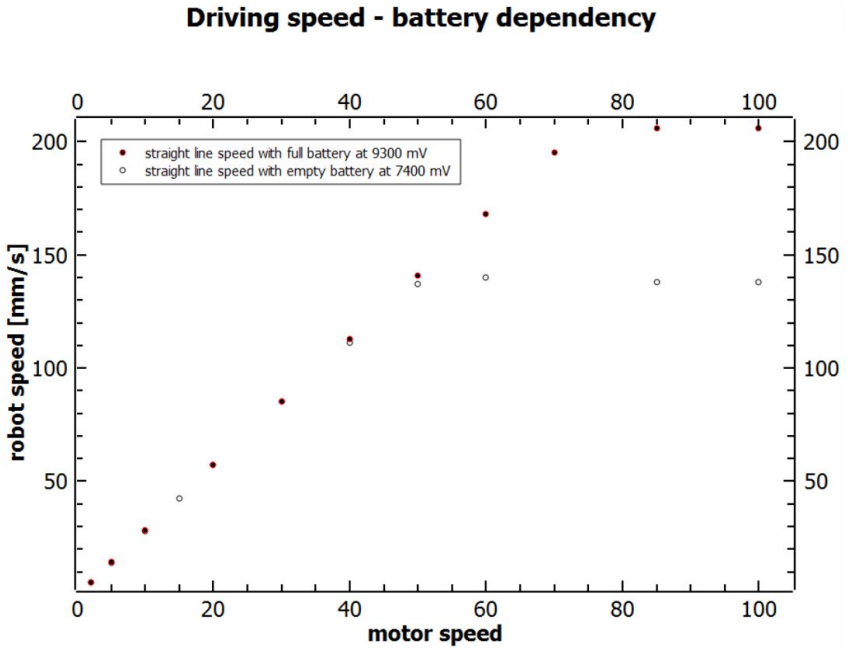
The robot has one rubber belt on each side which move over a front and a back wheel. The front wheel is driven by an electric motor. Included in the motor is a rotation sensor that senses position of the motor shaft. This allows the motor speed to be PID controlled. The motors can be controlled individually of each other and can turn forward and backwards.

Straight Line Speed:



Measured straight line driving speed as a function of programmed motor speed with fully charged batteries.

At motor speeds of 85 and above the robot starts to drift into a left turn.

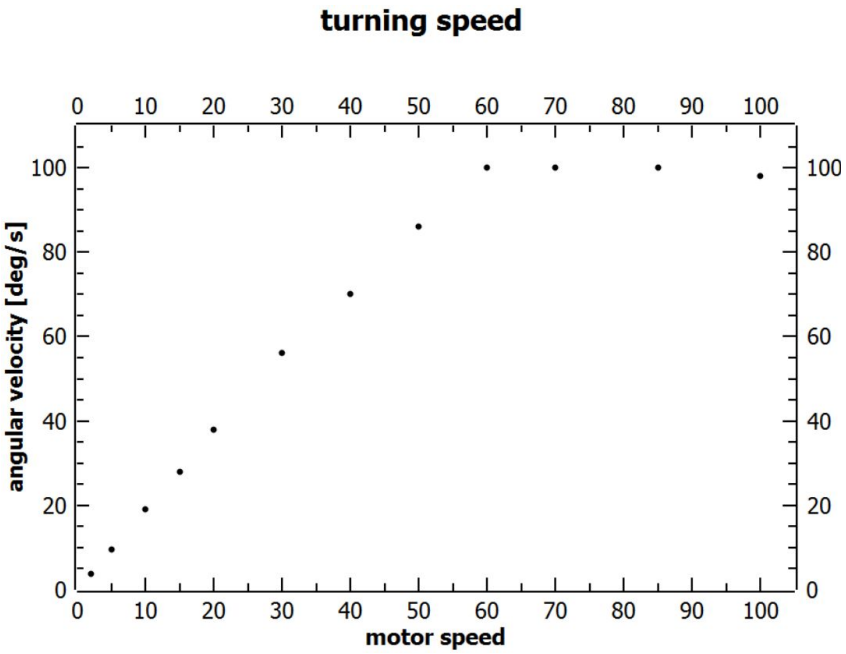


Forward straight line driving speed as a function of motor speed at different battery voltages.

At the lower battery voltage the robot starts a left turn at motor speeds of 60 and above.

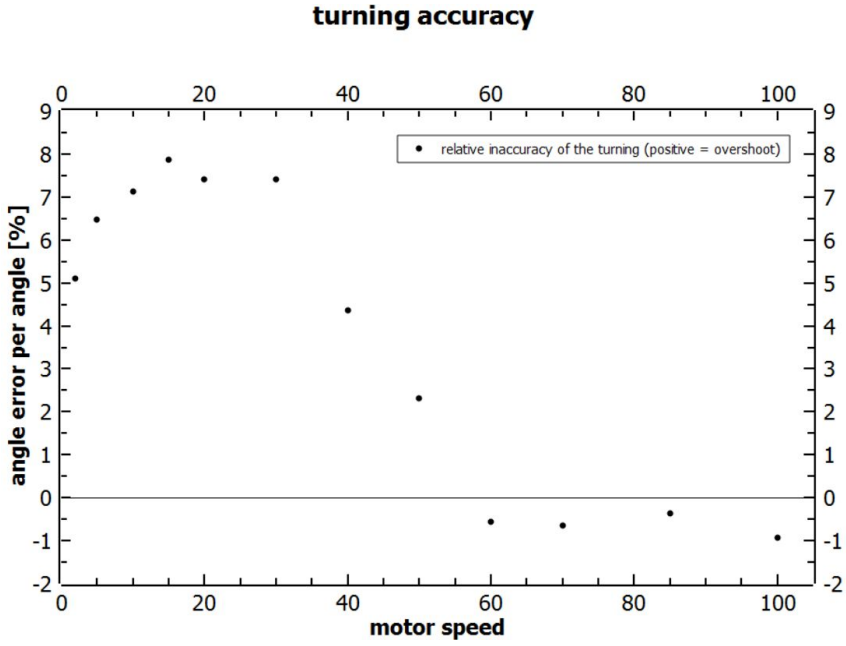
Turning Speed and Accuracy:

Turning the robot by using the motor command:



Turning speed using the motor function with motor(-x,x) where x is the programmed motor speed. This means the robot is turning counterclockwise on the spot with equal absolute motor speeds on both belts in opposite directions.

Accuracy of turning the robot with a programmable speed by a programmable angle using the turn command:



Relative deviation from the desired turning angle. A positive value means “overshooting” the desired turning angle.
A motor speed of i.e. 10 means that the robot turns with motor(-10,10) or motor(10,-10).

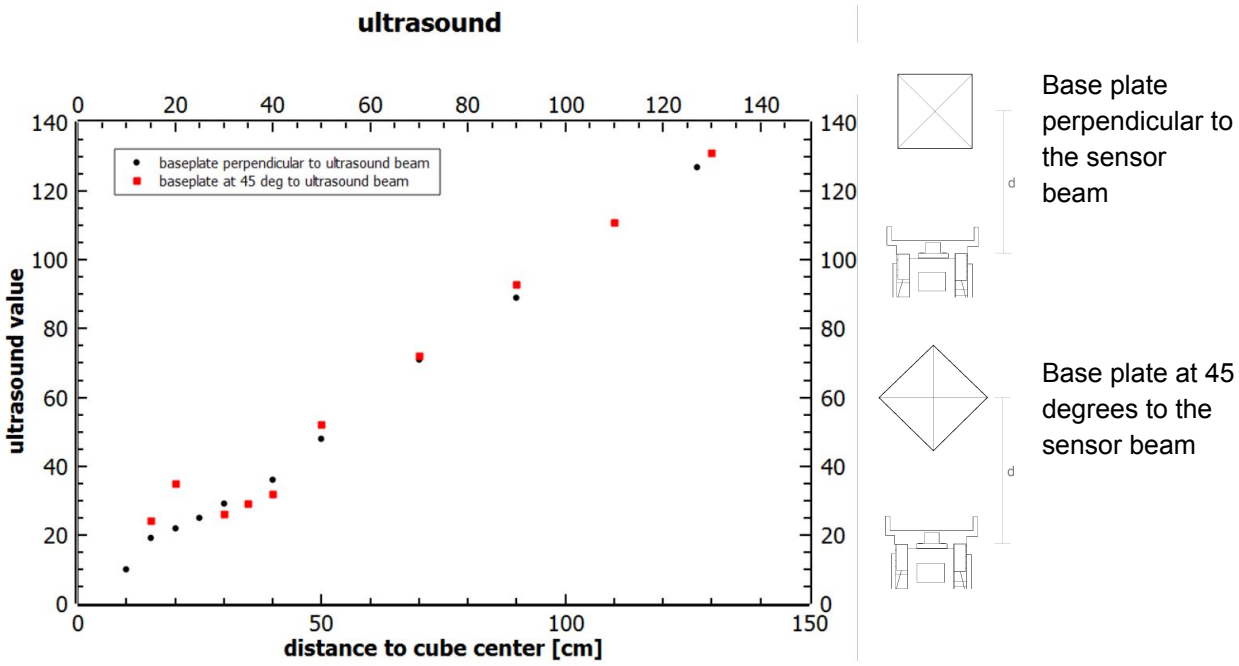
Sensors:

The robot is equipped with 4 sensors.

- Ultrasound distance sensor: points forward and measures the time of flight of a sound signal emitted from the robot and reflected off an object. This time can be converted into a distance measurement.
- Downwards reflection sensor: points downwards and measures the reflectivity of the surface under the robot
- Color and blink sensor: The robot has one of these sensors on each side. They point forward and measure the colored light reflectivity of objects and the light intensity of a blinking light with a frequency of 0,93 Hz.

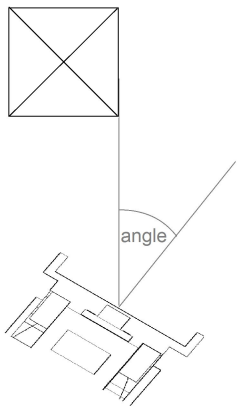
Ultrasound accuracy:

Ultrasound value as a function of distance from the ultrasound sensor to the center of the cube:



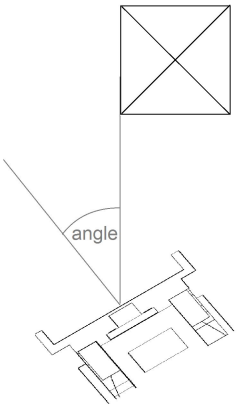
Ultrasound cut-off angles:

The ultrasound distance measurement remains accurate until the object is outside the field of view of the sensor. At the cut-off angle the object is no longer in the field of view of the ultrasound sensor. The cut-off angles are shown below:



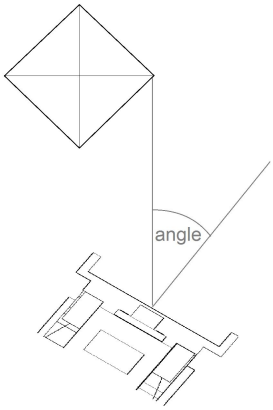
Cut-off angle:

35 ± 3 degrees



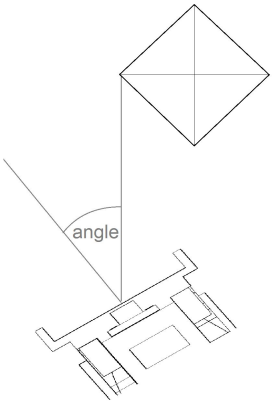
Cut-off angle:

35 ± 3 degrees



Cut-off angle:

22 ± 2 degrees



Cut-off angle:

26 ± 2 degrees

Downwards reflection sensor:

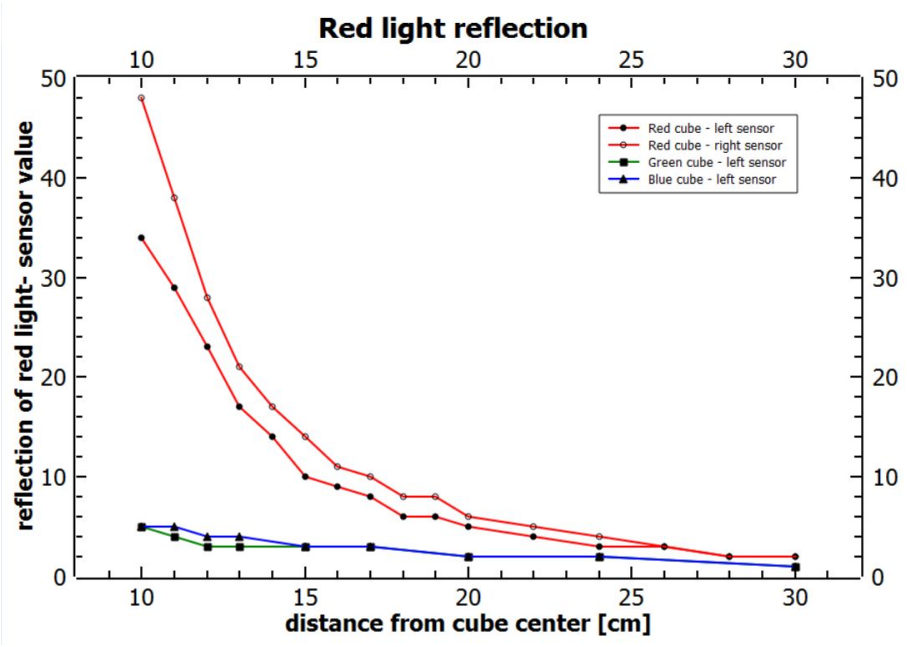
The reflection sensor sends out pulses of red light and detects how much of this light is reflected.

Sensor value on white paper: 47

Sensor value on cardboard: between 36 and 38

Sensor value when overhanging over the cardboard edge: 15

Red light reflection sensor sensitivity:

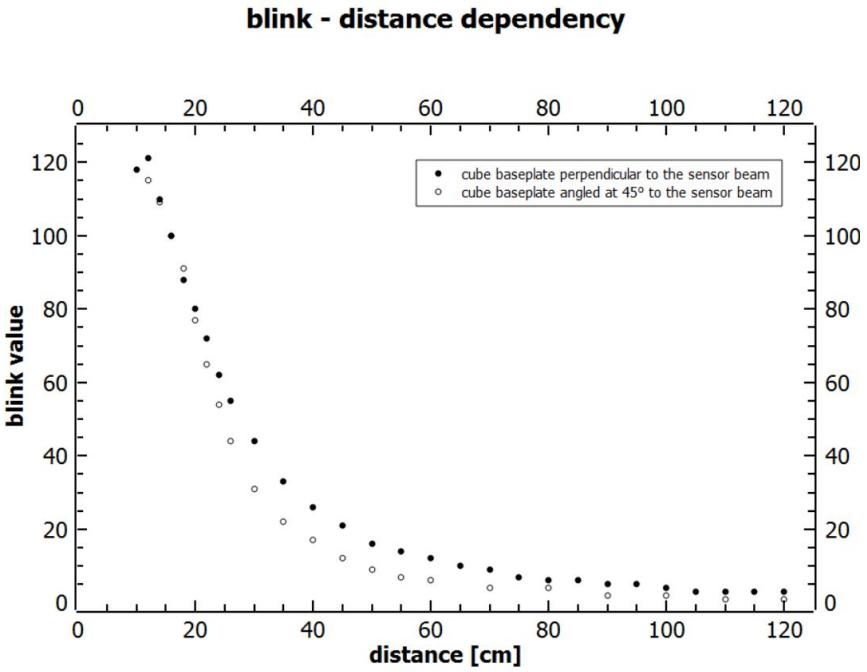


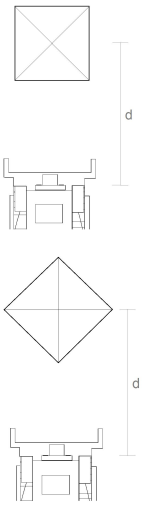
Reflectivity of red light off a red, green and blue cube dependent on the distance between the sensors and the center of the cubes.

Blink sensor sensitivity:

The blink sensor uses the same sensor as the color sensor except that it is responsive to a blinking light source at 0,93 Hz.

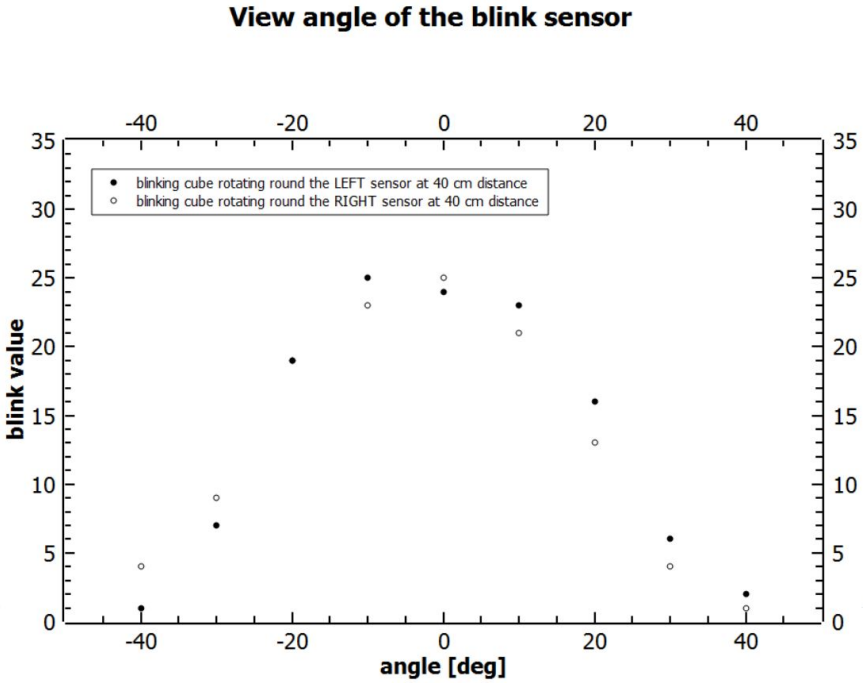
The following values were measured for a blink light placed upside down in the ceiling of a green cube.

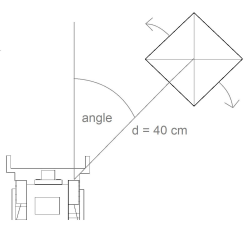




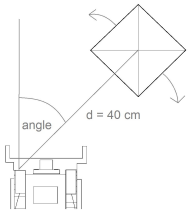
Base plate perpendicular to the sensor beam

Base plate at 45 degrees to the sensor beam



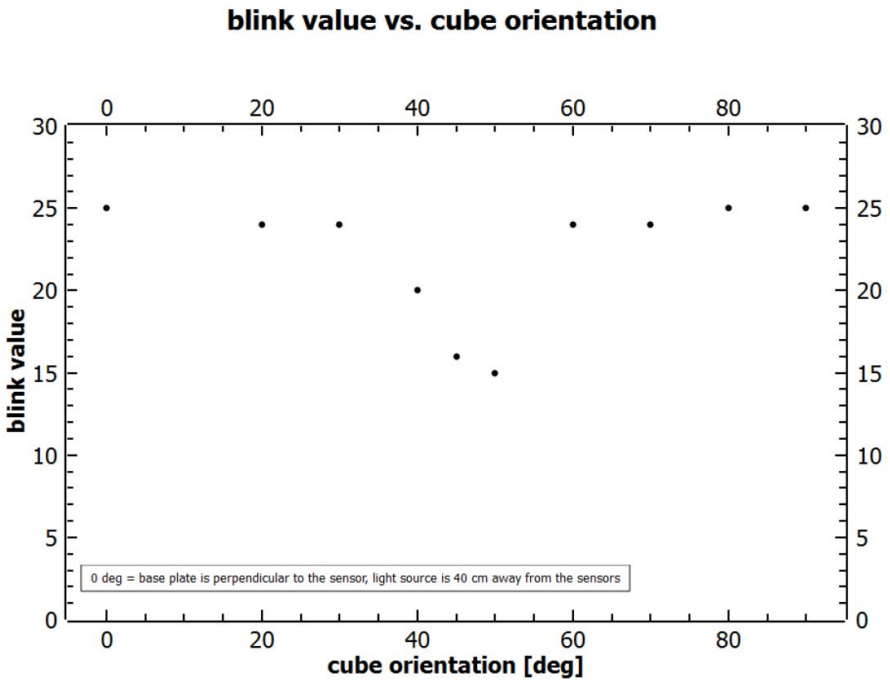


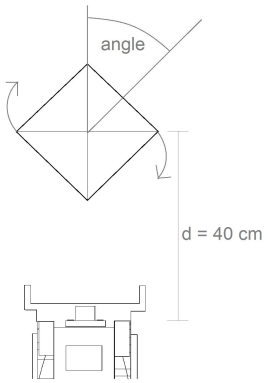
Right sensor



Left sensor

The color sensors have a similar view angle pattern.


blink value vs. cube orientation
blink value
cube orientation [deg]
0 deg = base plate is perpendicular to the sensor, light source is 40 cm away from the sensors


angle
d = 40 cm