



Семейство

домашних роботов

Roboking

Reporter
name:

Redkov V., victor.redkov@lge.com



2003



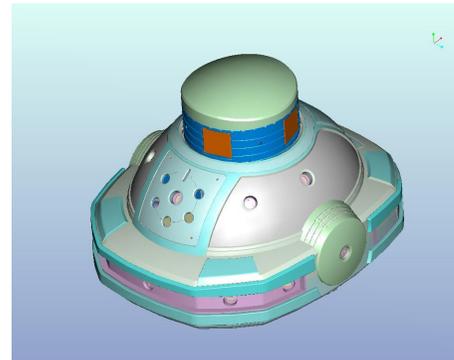
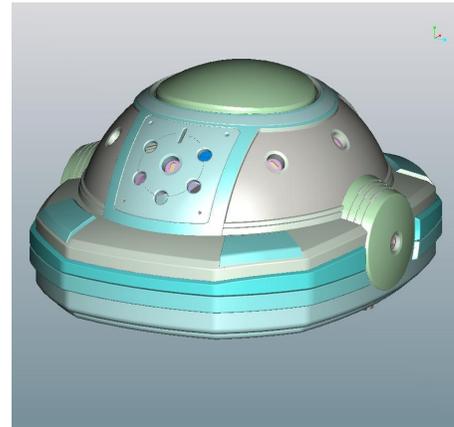
2006



2009





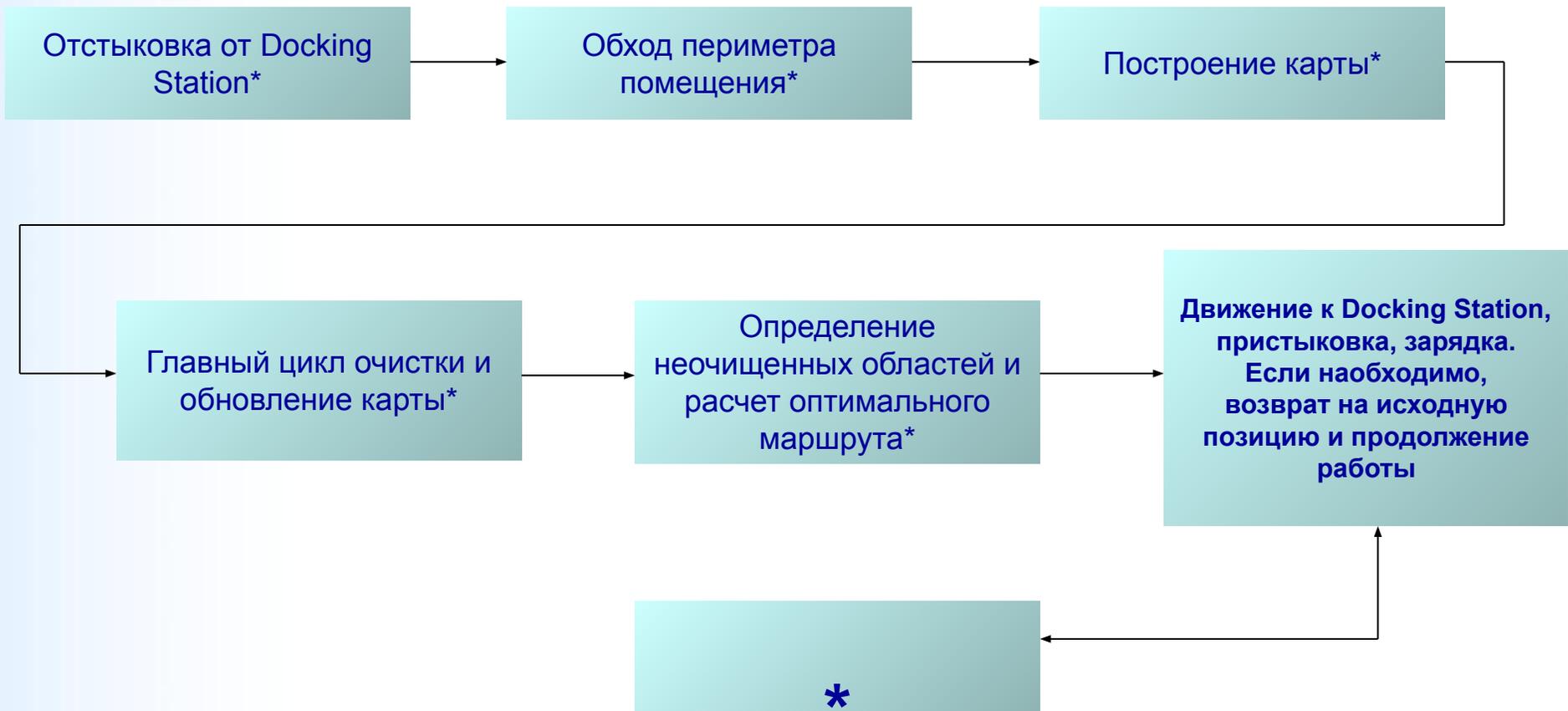


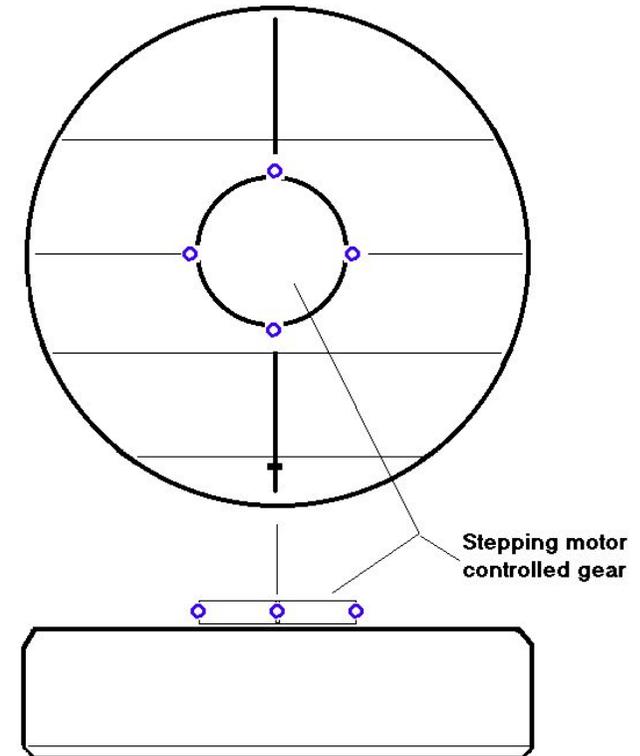
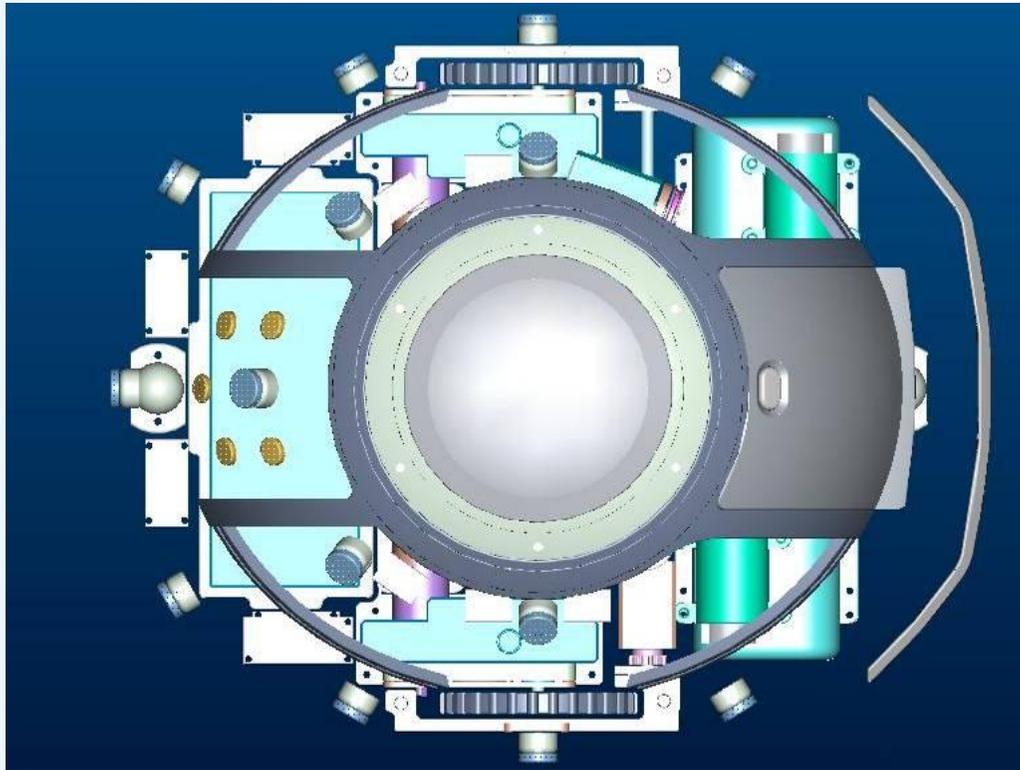
Режимы

- Обход периметра и построение карты
- Чистка
- Чистка пропущенных областей
- Передвижение в определенную область
- Возвращение к docking station
- Стыковка с docking station
- Расстыковка с docking station

Задачи

- Управление режимами работы
- Планирование траектории движения
- Управление во время движения
- Маневрирование около препятствий



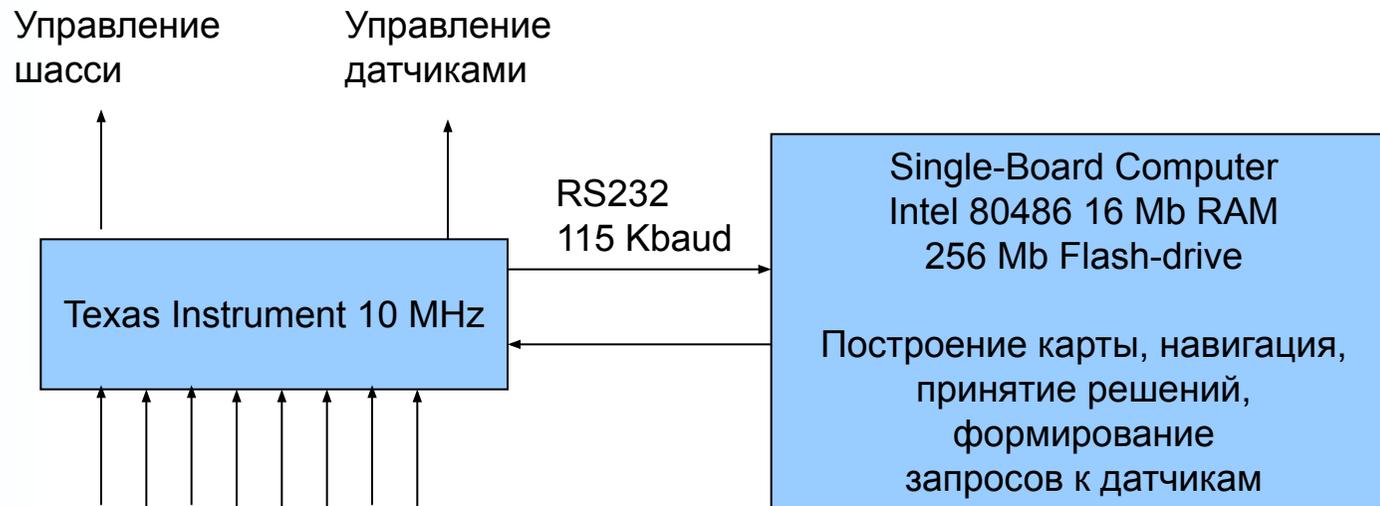


14 SRS => 38 виртуальных сонаров для обнаружения препятствий

4 LRS для измерений дальности

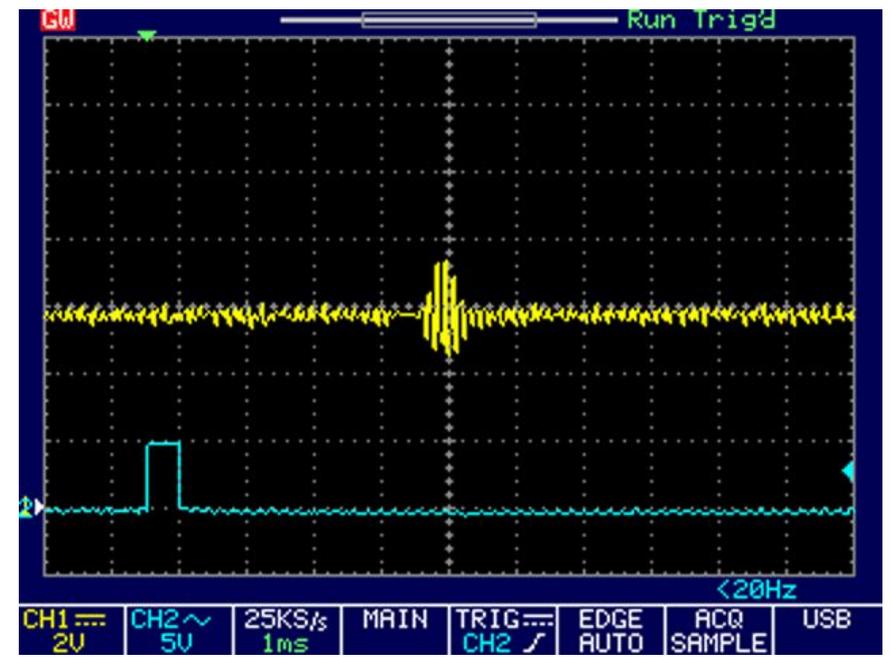
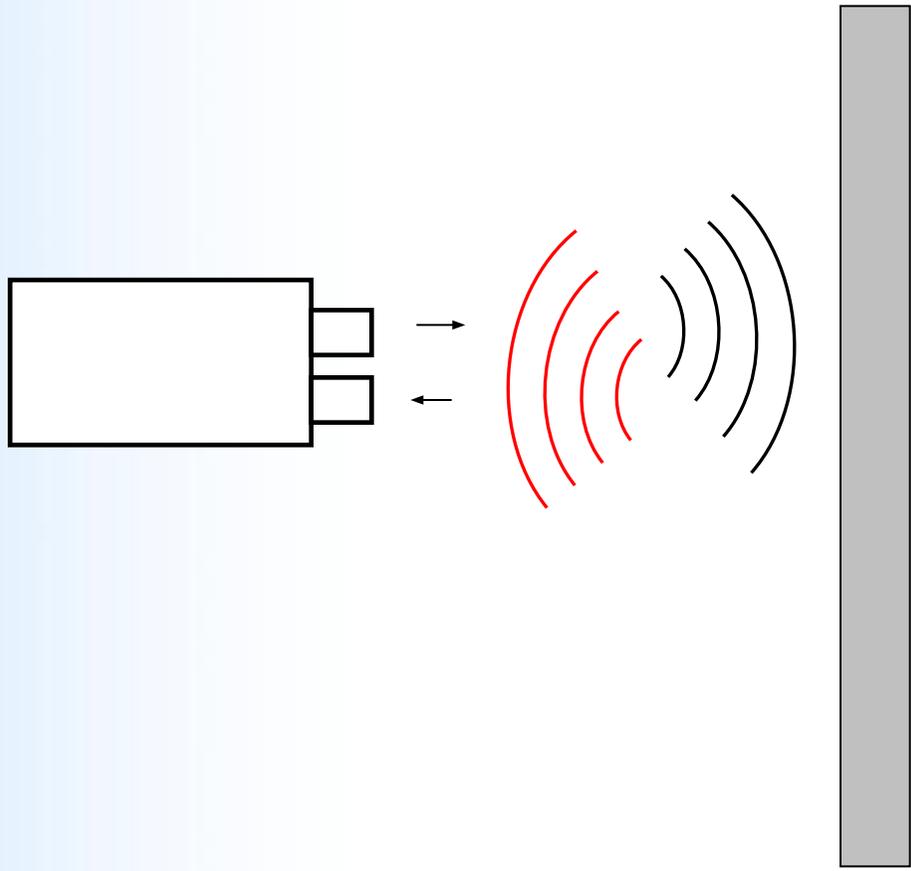
Дополнительные датчики для движения и ориентирования:

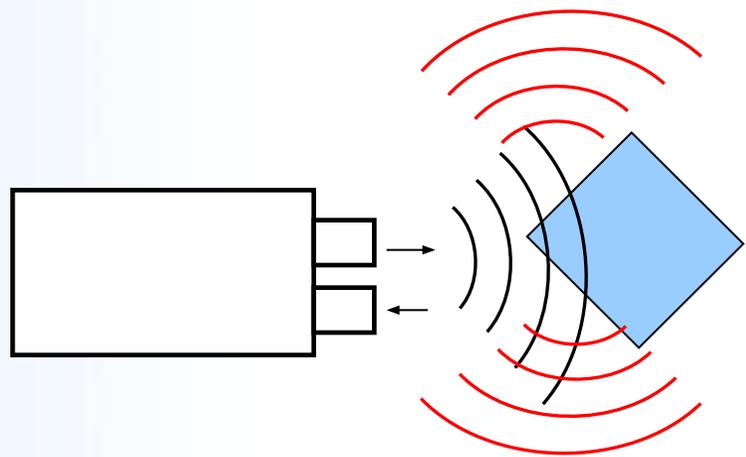
4 IR датчика уступов, бампер- 2 датчика.



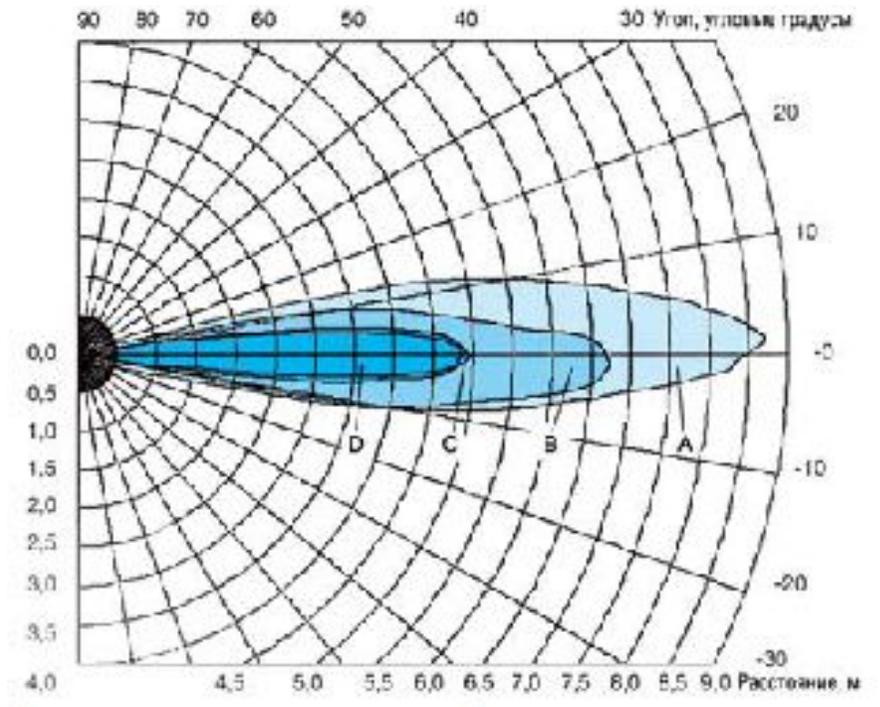
53 датчика:

- a) 38 сонаров;
- b) 4 датчика уступов;
- c) 2 одометра;
- d) угол поворота платформы LRS;
- e) 4 LRS сонара;
- f) 3 датчика стыковки;
- g) датчик оставшегося заряда батарей

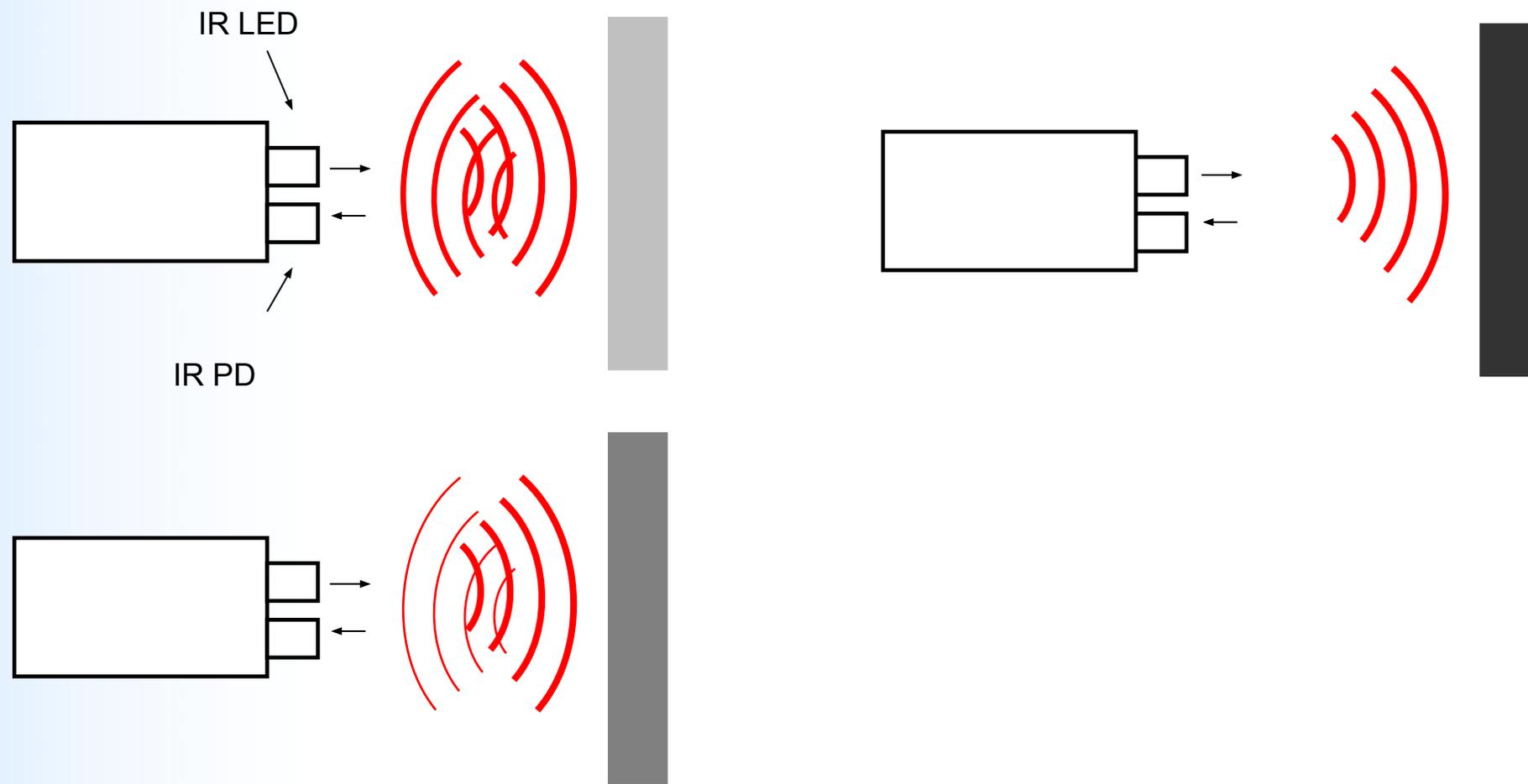


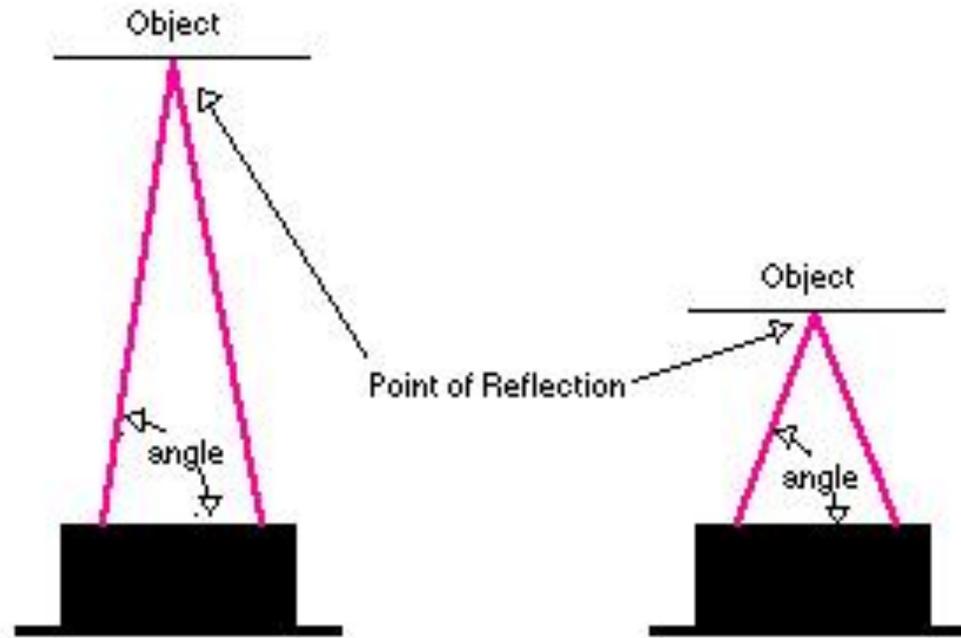


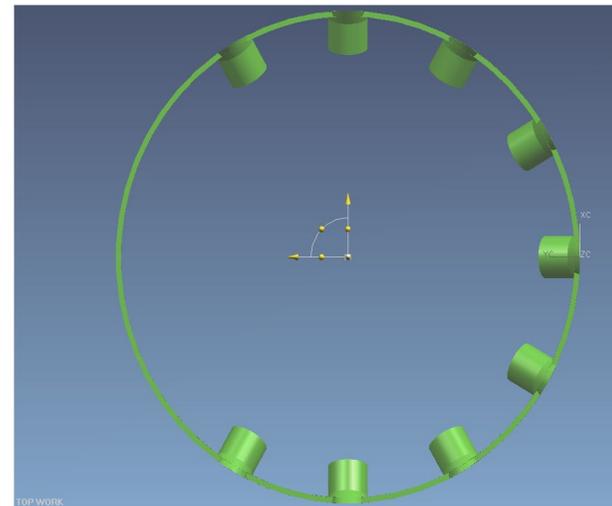
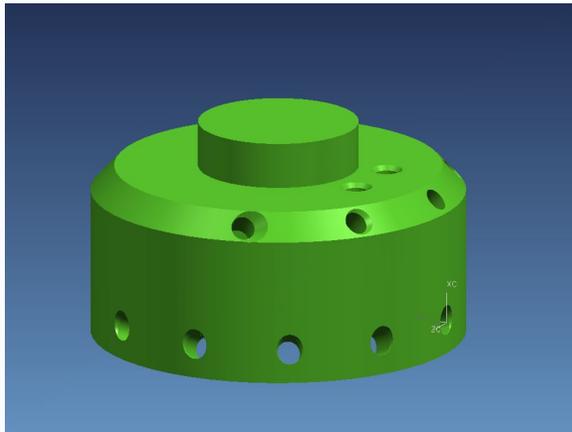
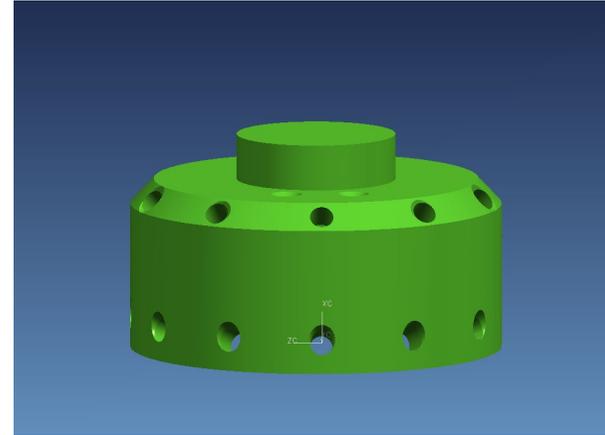
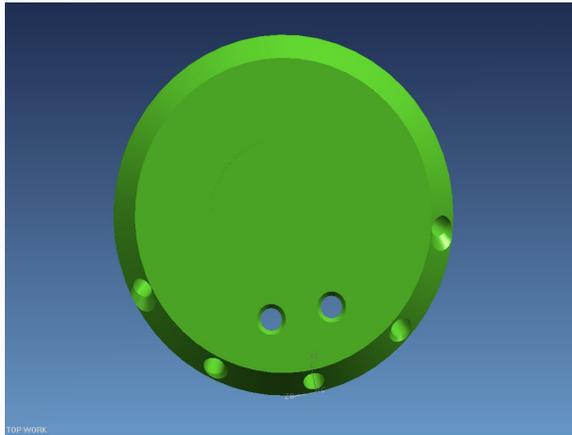
Отражение ультразвука от ножки стола

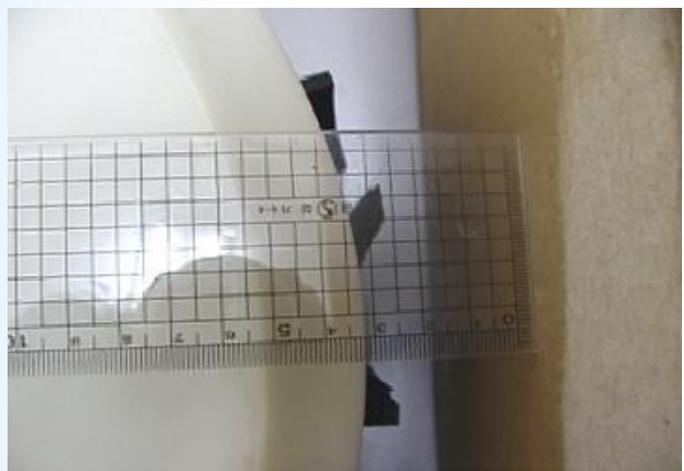


Пример диаграммы направленности реального излучателя

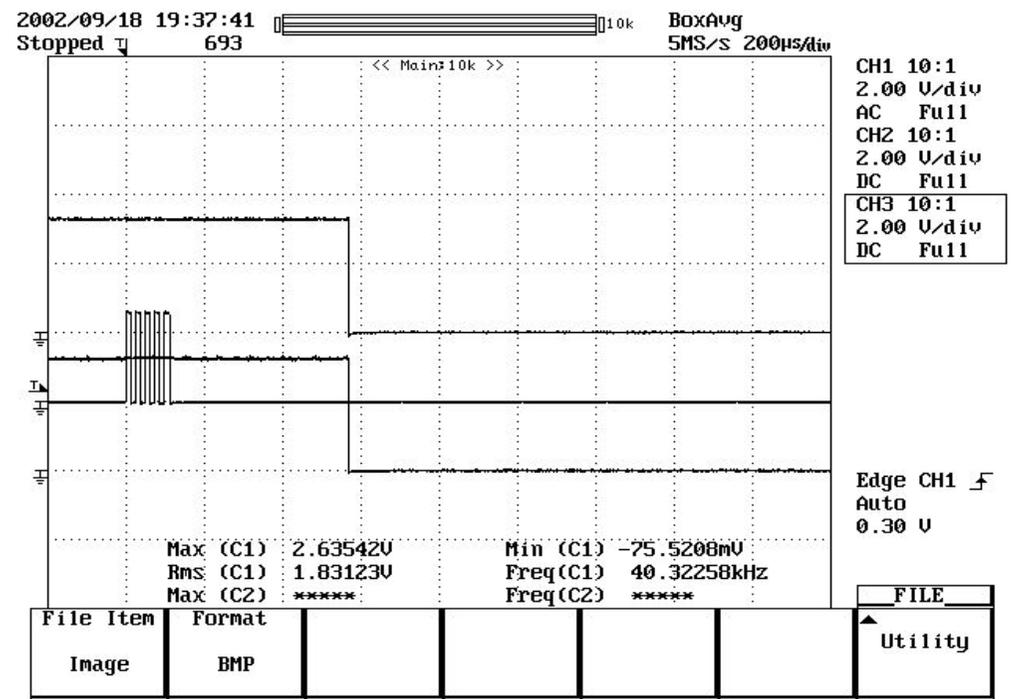


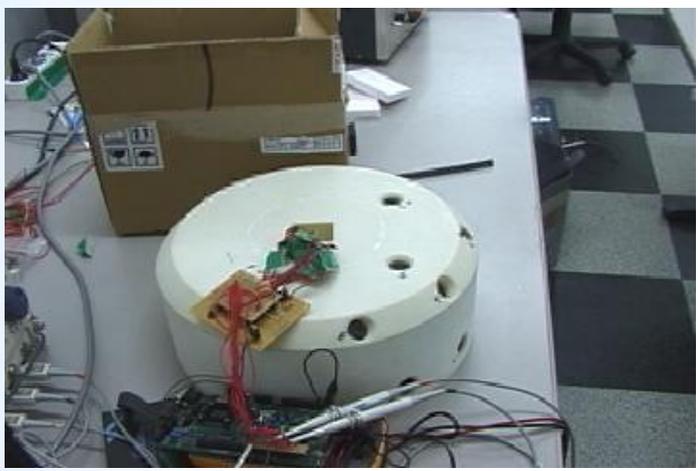




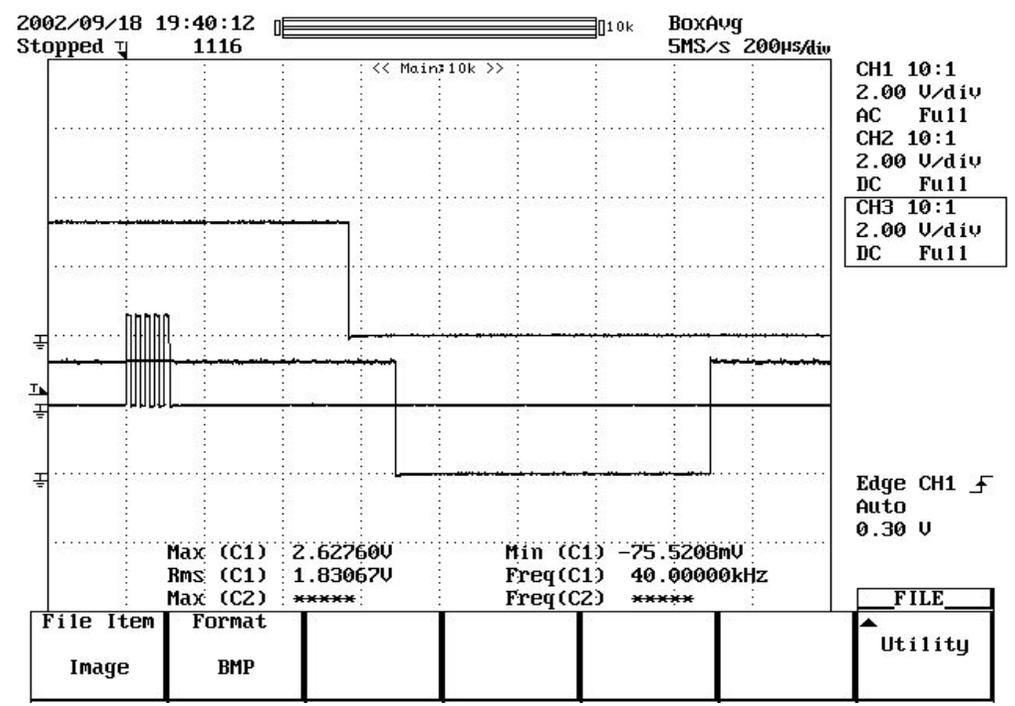


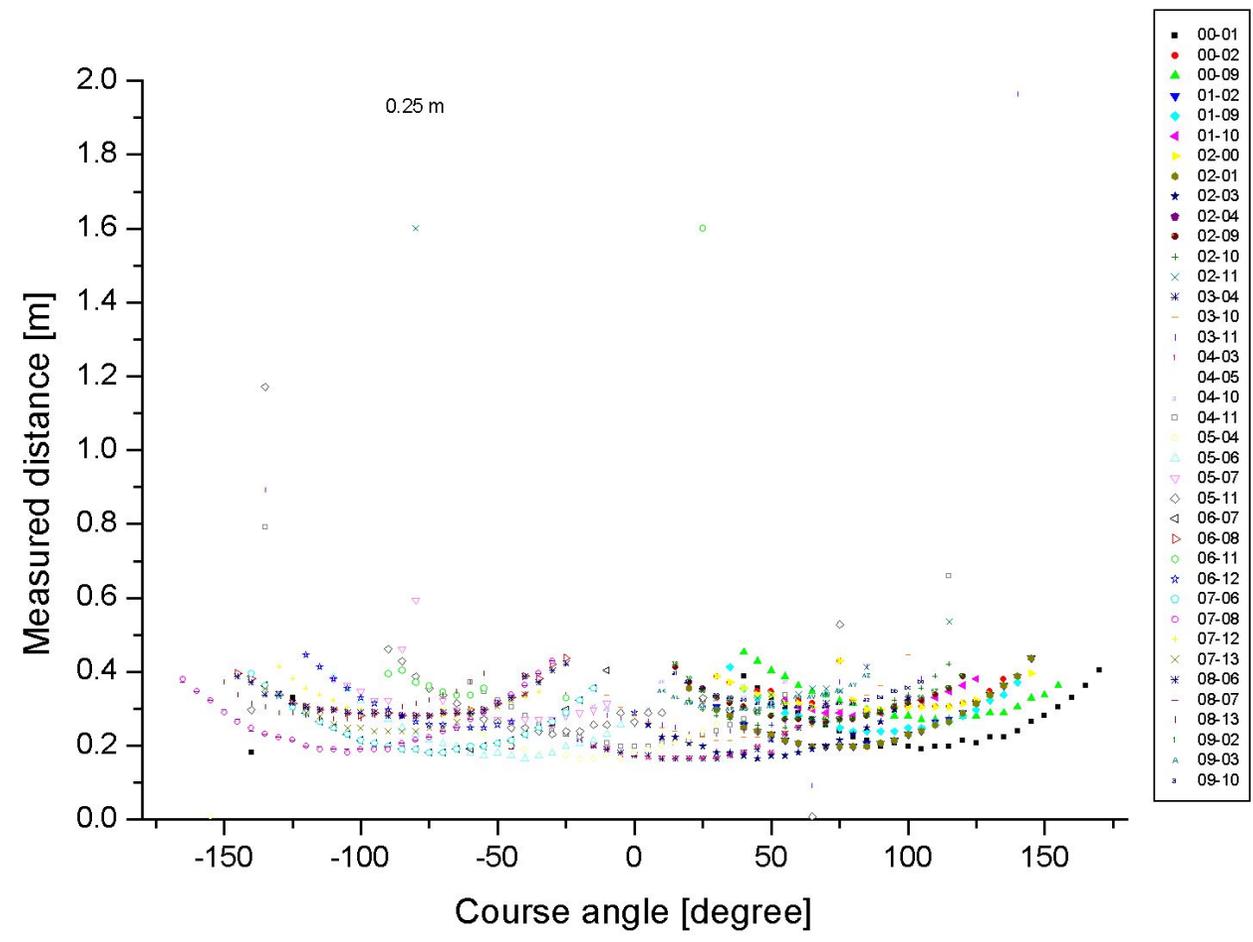
Detecting perpendicular wall.
Minimum distance : about 3cm

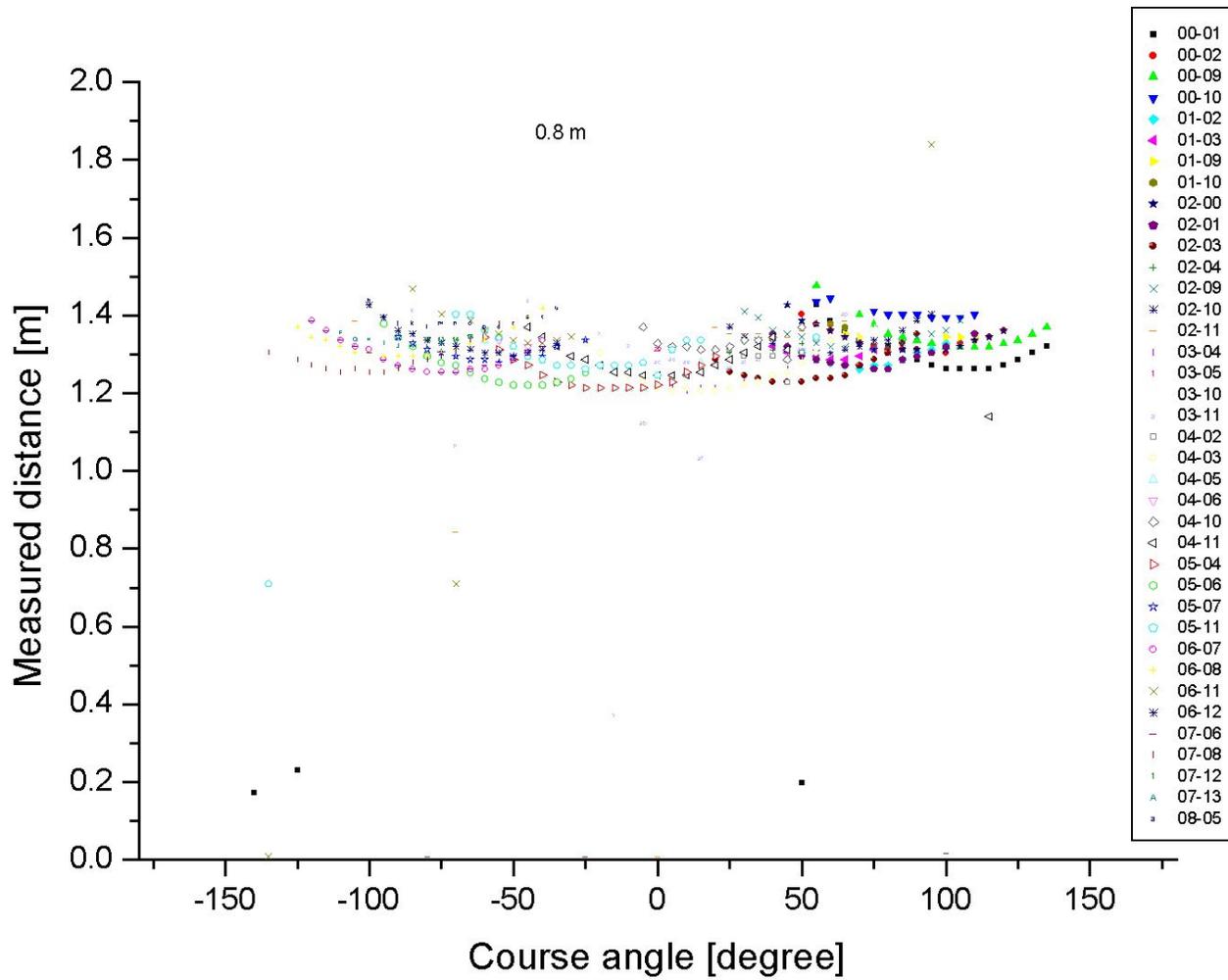


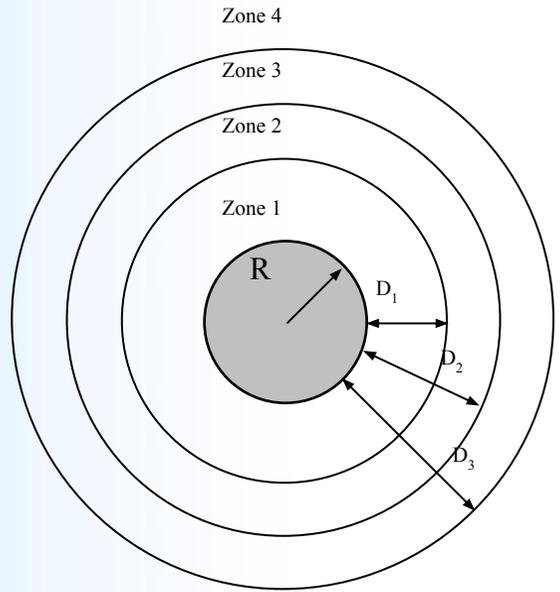


Detecting the end of wall.









- Zone 1: $\{R < x \leq R + D_1\}$
- Zone 2: $\{R + D_1 < x \leq R + D_2\}$
- Zone 3: $\{R + D_2 < x \leq R + D_3\}$
- Zone 4: $\{R + D_3 < x\}$

- R - for the zone 1 ("red zone");
- O - for the zone 2 ("orange zone");
- G - for the zone 3 ("green zone");
- Z - for the zone 4 ("zero zone").

Алфавит алгоритма: $A = \{R, O, G, Z\}$;

4	ZR	ZO	ZG	ZZ
3	GR	GO	GG	GZ
2	OR	OO	OG	OZ
1	RR	RO	RG	RZ
zones	1	2	3	4

Управляющая таблица для двух сонаров

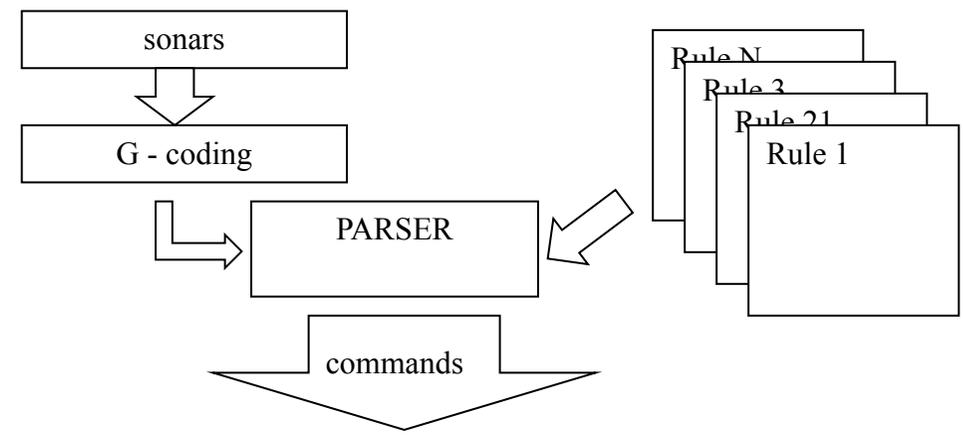
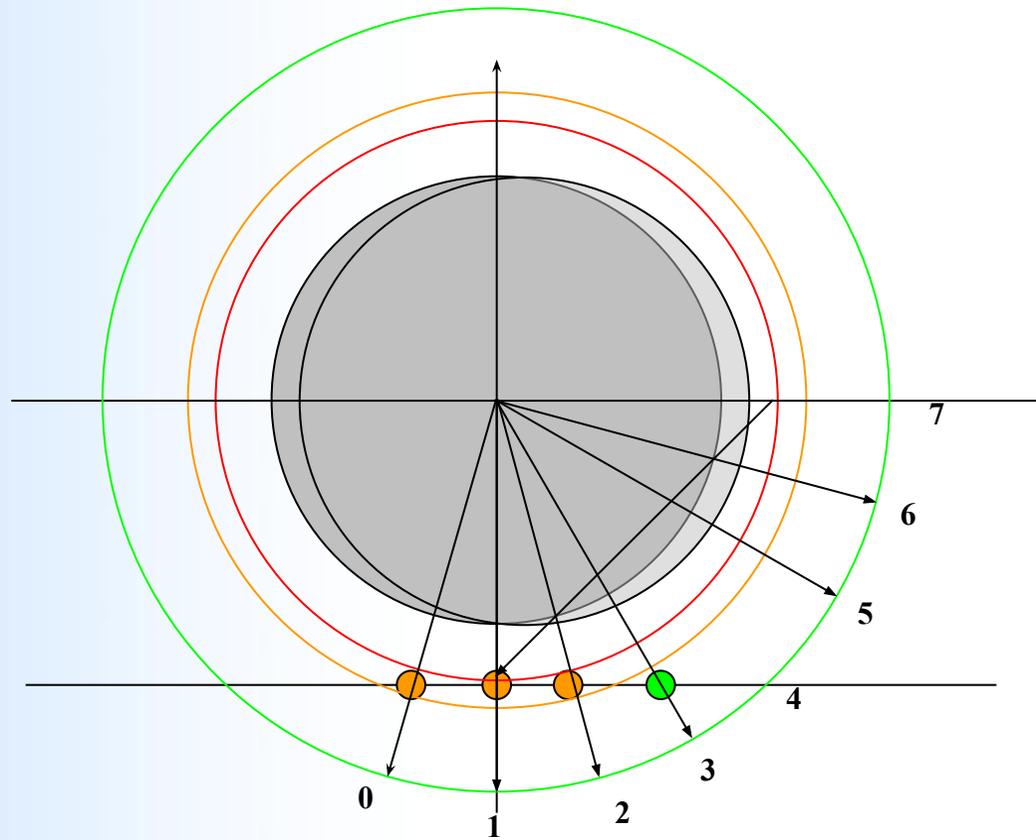
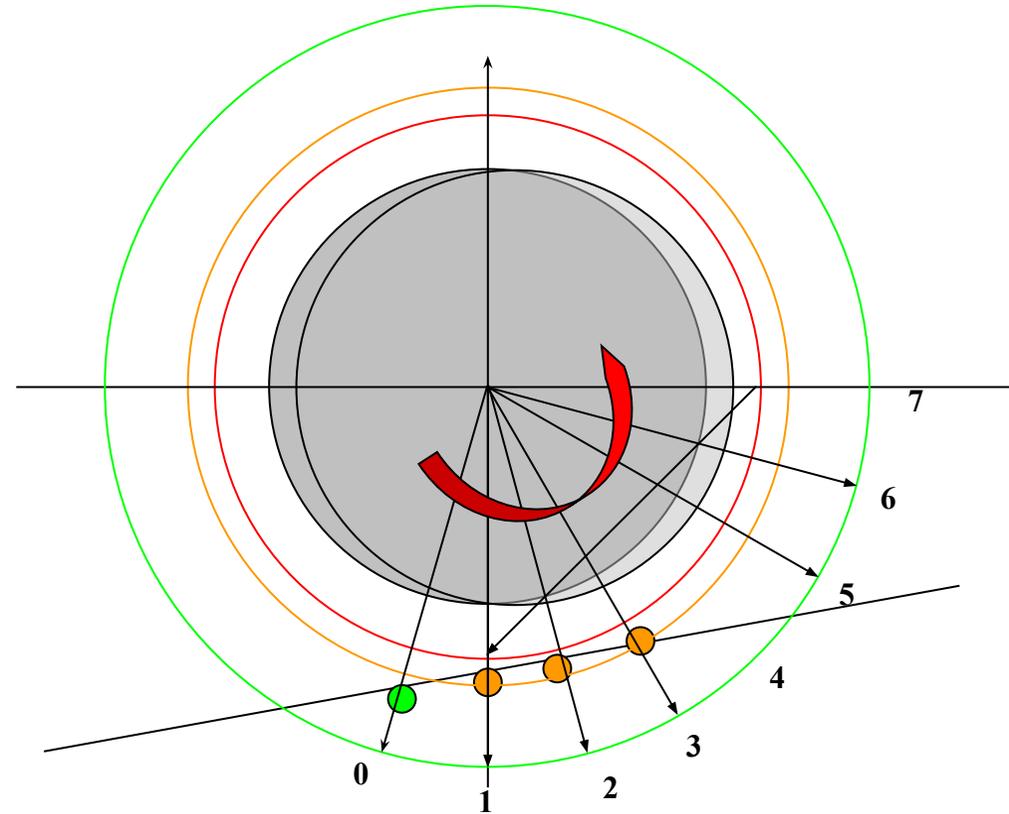


Схема алгоритма генерации команд управляющих шасси

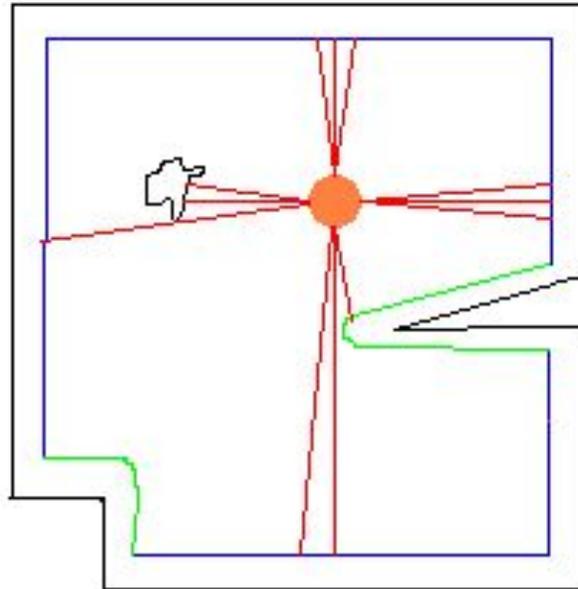


1. Движение вперед разрешено



2. Необходим поворот

Расположение семафоров Roboking

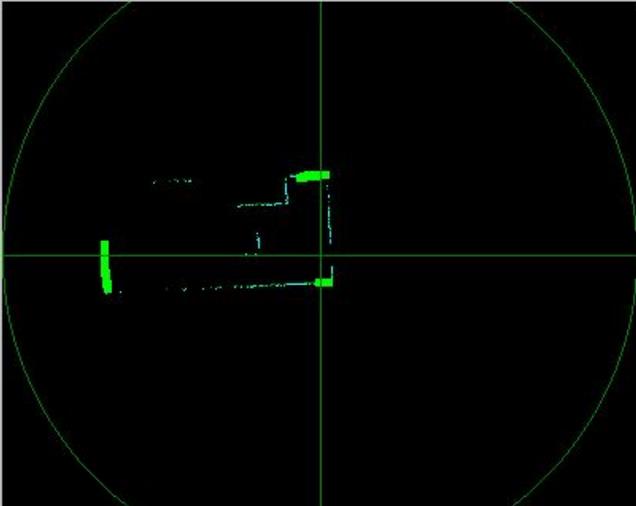
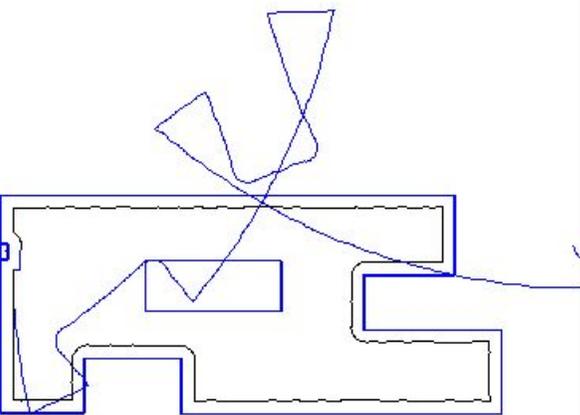
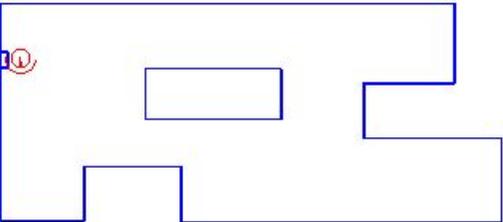
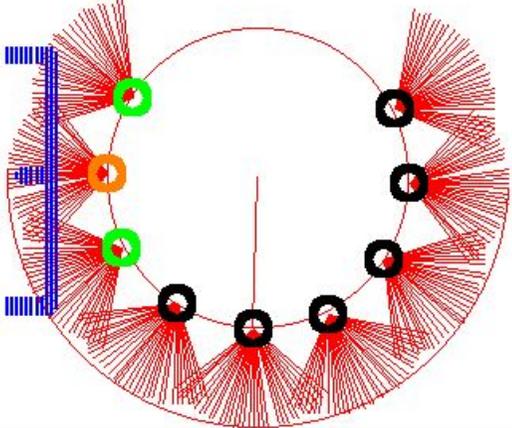


360-градусный обзор помещения производимых LRS

Room Robot, V2.4

Open... Perimeter Work Lacunas Go Home Go On Pause Stop Gathering Correct Help About Exit

Pos Number=1254, distance=10.0 (min=7.0)



Output

Progress

LR Sonar

Laser

North

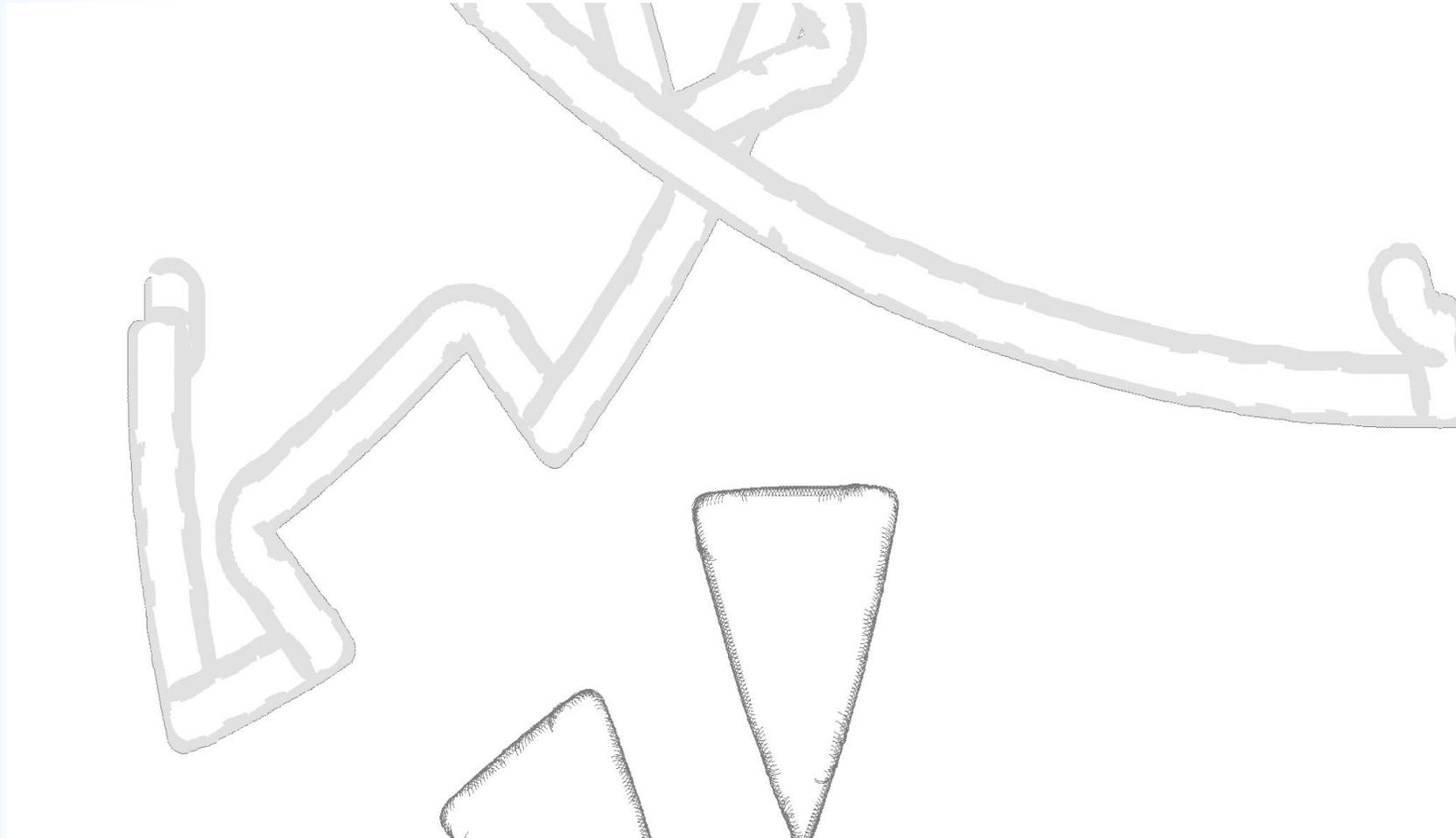
Errors

D	A	ON / OFF
<input type="checkbox"/>	<input type="checkbox"/>	Movement
<input type="checkbox"/>	<input type="checkbox"/>	Odometers
<input type="checkbox"/>	<input type="checkbox"/>	LR Sonars

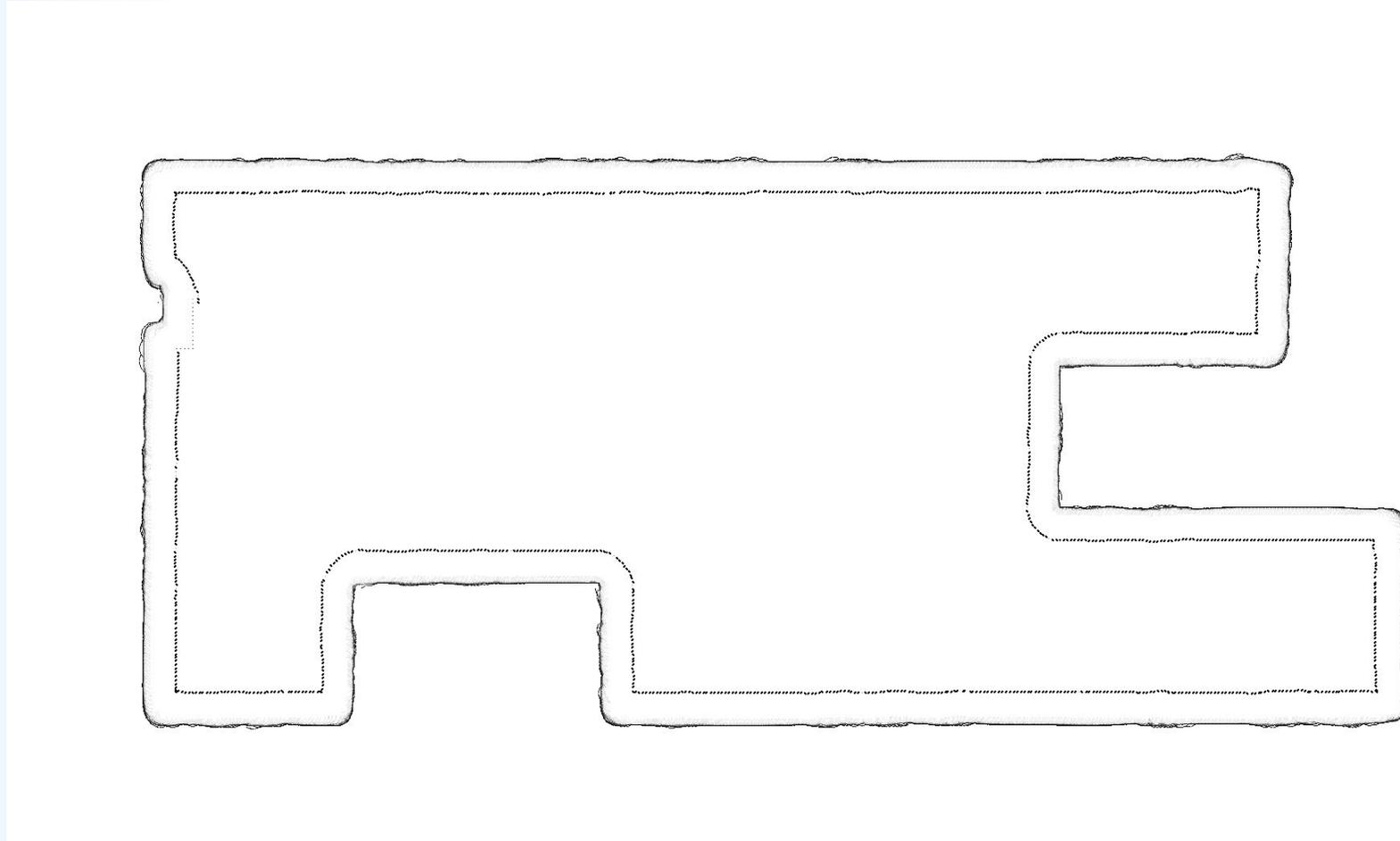
ERRORS is ON
rm_Mode = rm_PERIMETER
Path tracing
Start Maneuver finished
General Tracing
General Tracing Cycle finish
Report is writing...
Report written

Ready x= 60, y= -47 REAL pos.: X = 235 Y = 661 A = -92.70 - KNOWN pos.: X = 1971 Y = 681 A = 102.00

Start To M... O6so... Lingv... v4 - ... Room ... En 18:57



Восприятие роботом геометрии помещения после обхода периметра до коррекции

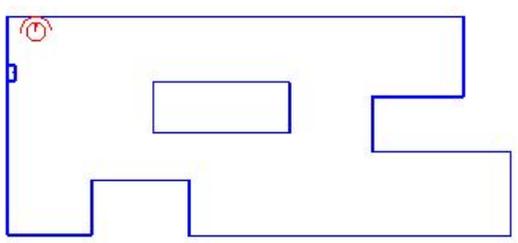
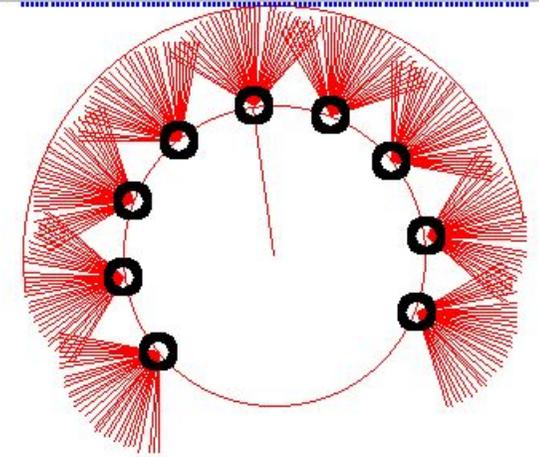


Восприятие роботом геометрии помещения после обработки данных полученных при обходе периметра

Room Robot, V2.4

Open... Perimeter Work **Lacunas** Go Home Go On Pause Stop Gathering Correct Help About Exit

Overview Pos Number=29, distance=200000.0

Output

Progress

LR Sonar

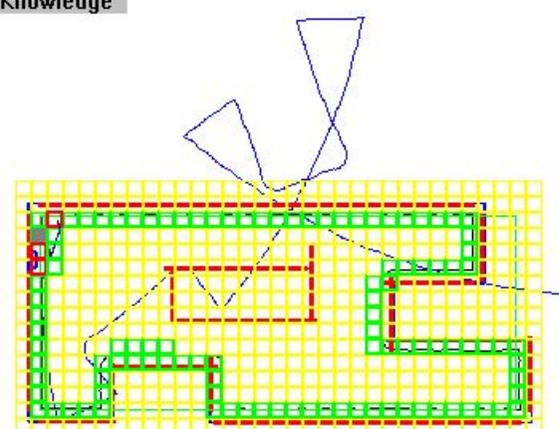
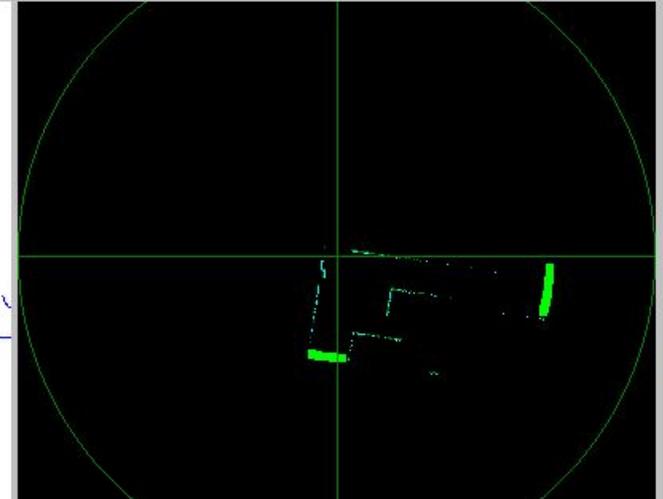
Laser

North

Errors

D	A	ON / OFF
<input type="checkbox"/>	<input type="checkbox"/>	Movement
<input type="checkbox"/>	<input type="checkbox"/>	Odometers
<input type="checkbox"/>	<input type="checkbox"/>	LR Sonars

Knowledge

```

ERRORS is ON
rm_Mode = rm_PERIMETER
Path tracing
Start Maneuver finished
General Tracing
General Tracing Cycle finish
Report is writing...
Report written
Correction is ON
LACUNAS Mode
target: 2 12
0:[ 0 ]- 999-[ 14 ]
target: 2 14
19:[ 14 ]- 13-[ 14 ]
    
```

Ready x=1890, y= 370 REAL pos.: X = 260 Y = 786 A = 98.60 - KNOWN pos.: X = 260 Y = 777 A = 104.08

Start [Taskbar icons] 19:25

Room Robot, V2.4

Open... Perimeter Work Lacunas Go Home Go On **Pause** Stop Gathering Correct Help About Exit

Overview Pos Number=943, distance=9.0 (min=6.71)

Output

Progress

LR Sonar

Laser

North

Errors

D	A	<input checked="" type="checkbox"/> ON / OFF
<input type="checkbox"/>	<input type="checkbox"/>	Movement
<input type="checkbox"/>	<input type="checkbox"/>	Odometers
<input type="checkbox"/>	<input type="checkbox"/>	LR Sonars

Knowledge

```

616:[ 14]-13-[13]
target: 7 3
701:[ 13]-11-[14]
target: 7 6
702:[ 14]-15-[14]
target: 7 15
723:[ 14]-13-[13]
target: 8 12
804:[ 13]-11-[14]
target: 8 1
820:[ 14]-13-[13]
target: 9 3
906:[ 13]-11-[14]
target: 9 6
907:[ 14]-15-[14]
target: 9 15
931:[ 14]-13-[13]
target: 10 6
932:[ 13]-11-[14]
    
```

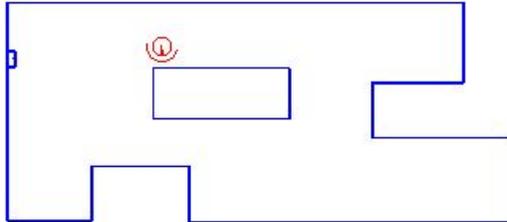
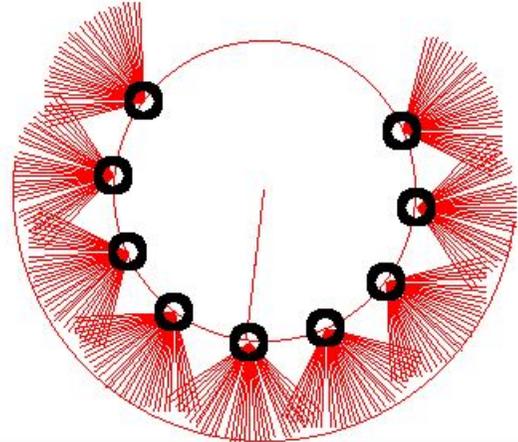
Ready x=1800, y=-1140 REAL pos.: X = 634 Y = 433 A = -12.93 - KNOWN pos.: X = 632 Y = 429 A = -11.33

Start [Taskbar icons] 19:35

Room Robot, V2.4

Open... Perimeter Work Lacunas Go Home Go On **Pause** Stop Gathering Correct Help About Exit

Overview Pos Number=1931, distance=200000.0

Output

Progress

LR Sonar

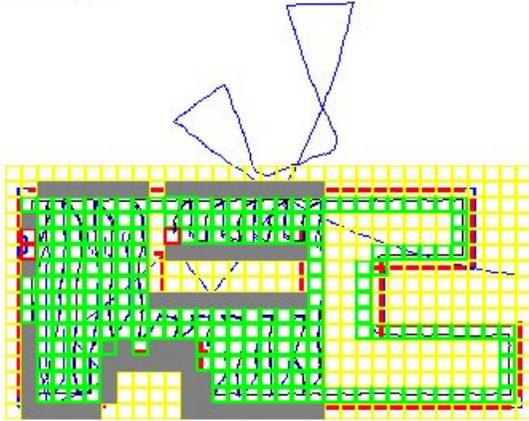
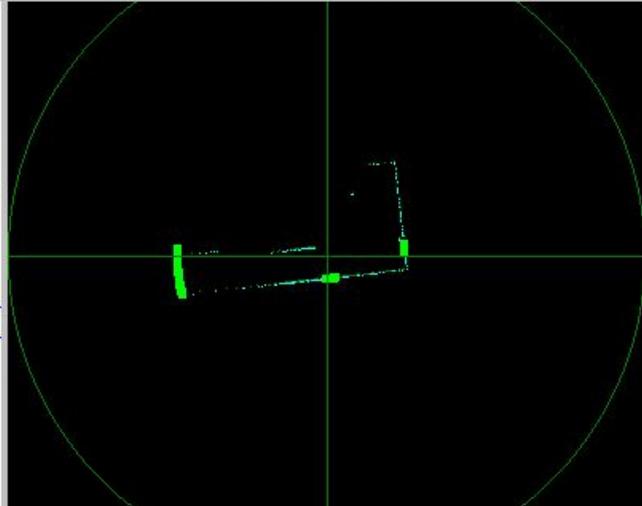
Laser

North

Errors

D	A	<input checked="" type="checkbox"/> ON / OFF
<input type="checkbox"/>	<input type="checkbox"/>	Movement
<input type="checkbox"/>	<input type="checkbox"/>	Odometers
<input type="checkbox"/>	<input type="checkbox"/>	LR Sonars

Knowledge

```

1757:[ 13 ]-11-[ 14 ]
target: 14 11
1776:[ 14 ]-13-[ 13 ]
target: 13 11
1792:[ 13 ]-11-[ 14 ]
target: 13 15
1806:[ 14 ]-13-[ 13 ]
target: 12 12
1830:[ 13 ]-11-[ 14 ]
target: 12 8
1849:[ 14 ]-13-[ 13 ]
target: 11 11
1865:[ 13 ]-11-[ 14 ]
target: 11 15
1879:[ 14 ]-13-[ 13 ]
target: 10 12
1903:[ 13 ]-11-[ 14 ]
target: 10 11
1921:[ 14 ]-13-[ 13 ]
    
```

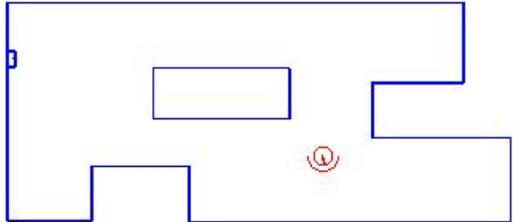
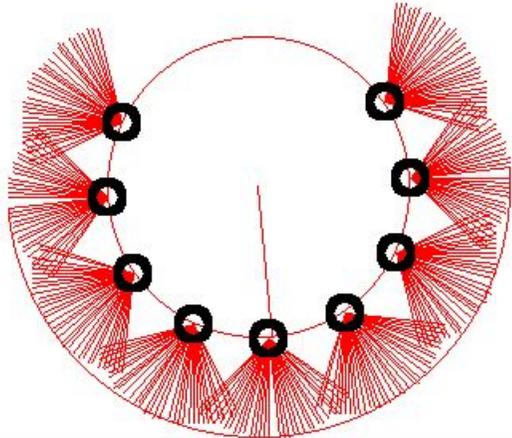
Ready cX= 37, cY= 16 REAL pos.: X = 658 Y = 696 A = -96.34 - KNOWN pos.: X = 653 Y = 692 A = -104.09

Start [Taskbar icons] 19:46

Room Robot, V2.4

Open... Perimeter Work Lacunas Go Home Go On **Pause** Stop Gathering Correct Help About Exit

Overview Pos Number=3960, distance=200000.0

Output

Progress

LR Sonar

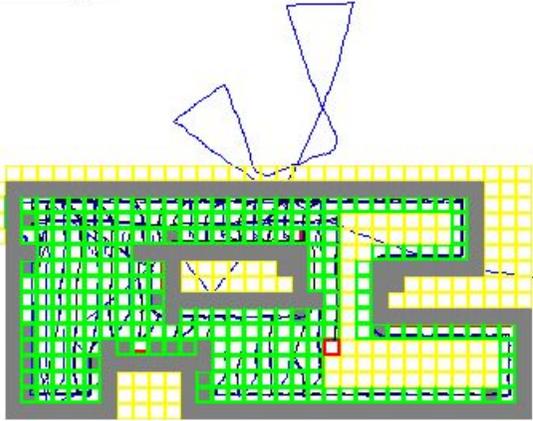
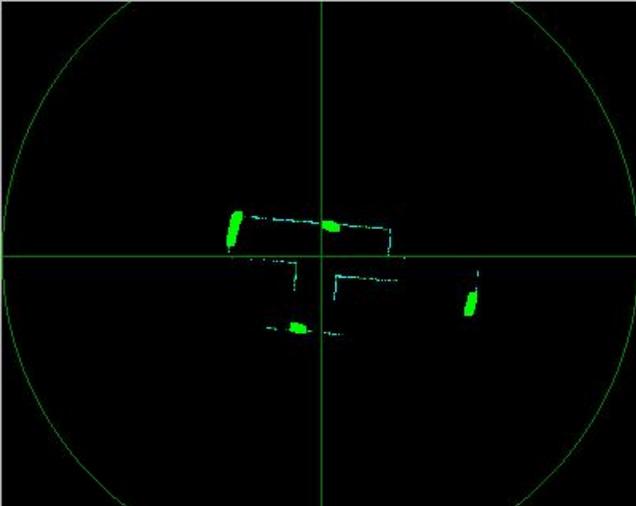
Laser

North

Errors

D	A	<input checked="" type="checkbox"/> ON / OFF
<input type="checkbox"/>	<input type="checkbox"/>	Movement
<input type="checkbox"/>	<input type="checkbox"/>	Odometers
<input type="checkbox"/>	<input type="checkbox"/>	LR Sonars

Knowledge

```

target: 0 13
2393:[ 14]-15-[ 14]
2414: Left wall lost
2415: Left wall lost
target: 0 12
2415:[ 14]-13-[ 13]
target: 0 12
2434:[ 13]-11-[ 14]
2850: Left nothing
      Left wall lost
2851: Left nothing
      Left wall lost
3550: Top wall lost
3551: Top wall lost
3552: Top wall lost
target: 20 12
3658:[ 14]-15-[ 14]
target: 20 1
3872:[ 14]-13-[ 13]
    
```

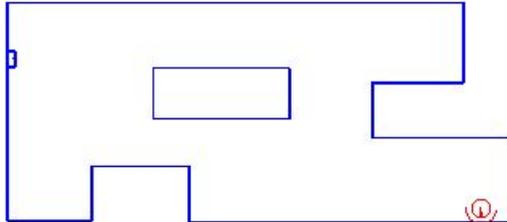
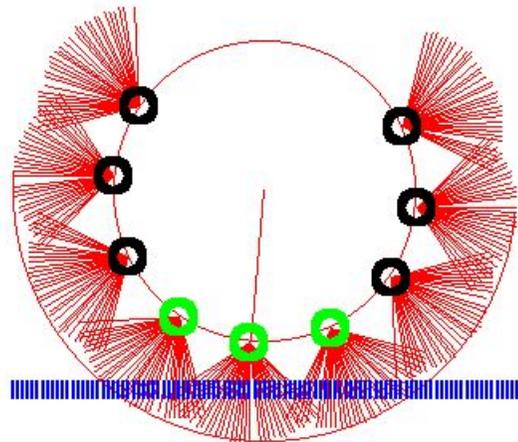
Ready x= 61, y=-40 REAL pos.: X = 1160 Y = 353 A = -85.59 - KNOWN pos.: X = 1159 Y = 348 A = -78.66

Start [Taskbar icons] 20:07

Room Robot, V2.4

Open... Perimeter Work Lacunas Go Home Go On **Pause** Stop Gathering Correct Help About Exit

Overview Pos Number=4673, distance=9.0 (min=9.0)

Output

Progress

LR Sonar

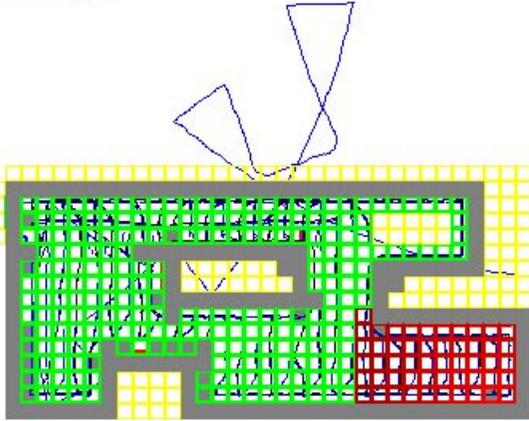
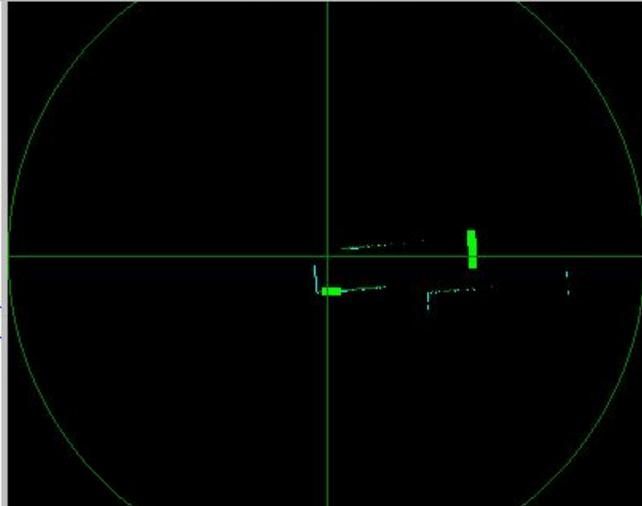
Laser

North

Errors

D	A	<input checked="" type="checkbox"/> ON / OFF
<input type="checkbox"/>	<input type="checkbox"/>	Movement
<input type="checkbox"/>	<input type="checkbox"/>	Odometers
<input type="checkbox"/>	<input type="checkbox"/>	LR Sonars

Knowledge

```

4430:[ 13 ]-11-[ 14 ]
target: 26 1
4445:[ 14 ]-13-[ 13 ]
target: 27 2
4479:[ 13 ]-11-[ 14 ]
target: 27 5
4495:[ 14 ]-13-[ 13 ]
target: 28 4
4527:[ 13 ]-11-[ 14 ]
target: 28 1
4543:[ 14 ]-13-[ 13 ]
target: 29 2
4576:[ 13 ]-11-[ 14 ]
target: 29 5
4593:[ 14 ]-13-[ 13 ]
target: 30 4
4623:[ 13 ]-11-[ 14 ]
target: 30 1
4638:[ 14 ]-13-[ 13 ]
    
```

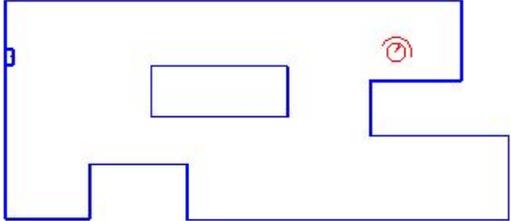
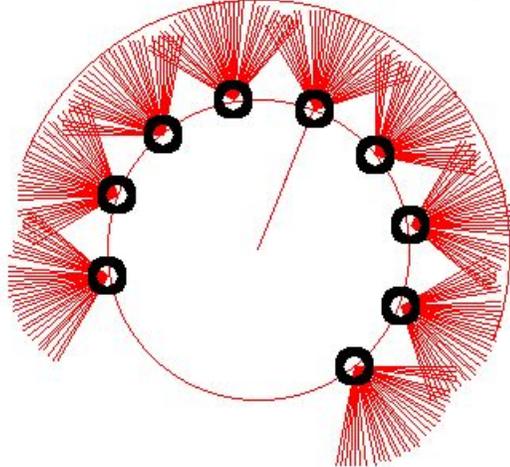
Ready x=1430, y= 570 REAL pos.: X = 1659 Y = 187 A = -95.04 - KNOWN pos.: X = 1657 Y = 186 A = -90.00

Start [Taskbar icons] Roo... 20:15

Room Robot, V2.4

Open... Perimeter Work Lacunas Go Home Go On **Pause** Stop Gathering Correct Help About Exit

Overview Pos Number=4944, distance=200000.0

Output

Progress

LR Sonar

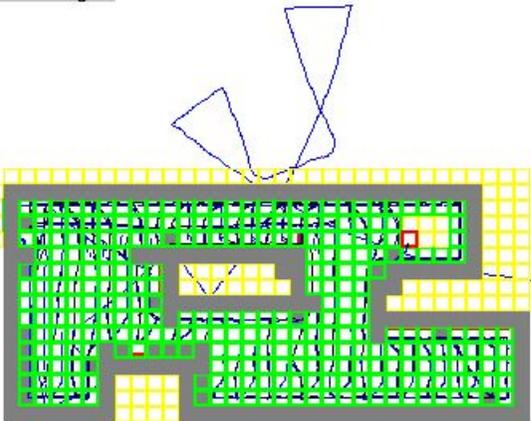
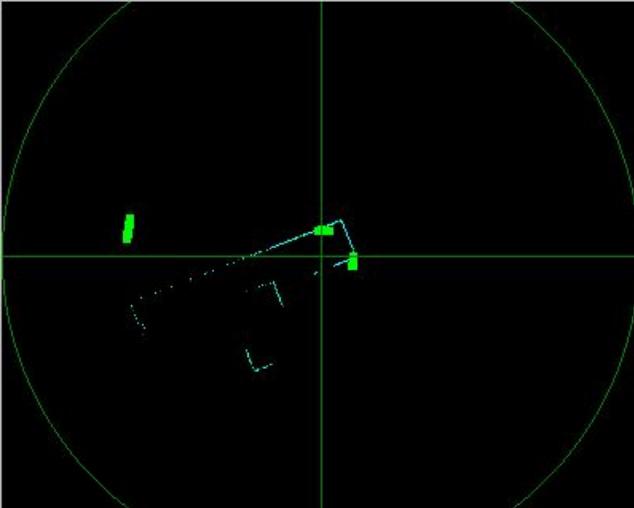
Laser

North

Errors

D	A	<input checked="" type="checkbox"/> ON / OFF
<input type="checkbox"/>	<input type="checkbox"/>	Movement
<input type="checkbox"/>	<input type="checkbox"/>	Odometers
<input type="checkbox"/>	<input type="checkbox"/>	LR Sonars

Knowledge

```

4543:[ 14]-13-[ 13]
target: 29 2
4576:[ 13]-11-[ 14]
target: 29 5
4593:[ 14]-13-[ 13]
target: 30 4
4623:[ 13]-11-[ 14]
target: 30 1
4638:[ 14]-13-[ 13]
target: 23 11
4673:[ 13]-11-[ 14]
target: 23 13
4857:[ 14]-13-[ 13]
target: 24 12
4882:[ 13]-11-[ 14]
target: 24 11
4902:[ 14]-13-[ 13]
target: 25 11
4928:[ 13]-11-[ 14]
    
```

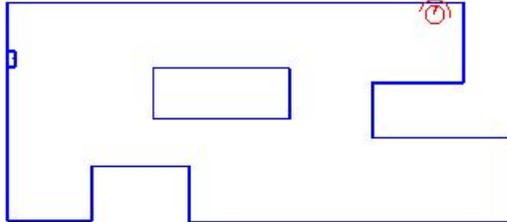
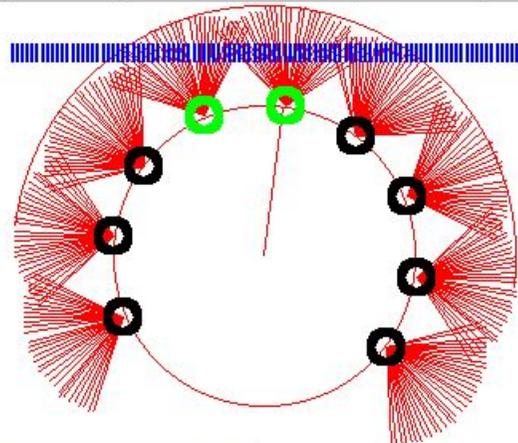
Ready x=1130, y=-850 REAL pos.: X = 1399 Y = 673 A = 68.65 - KNOWN pos.: X = 1392 Y = 668 A = 85.94

Start [Taskbar icons] Roo... 20:18

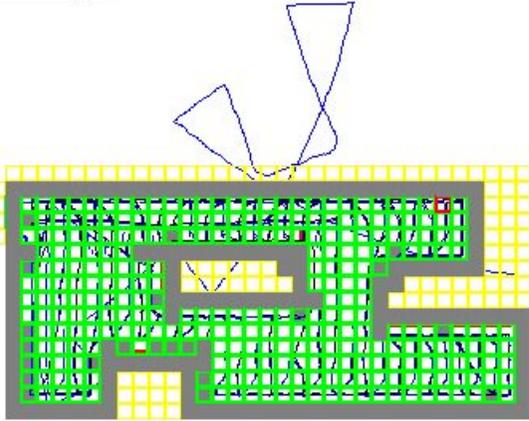
Room Robot, V2.4

Open... Perimeter Work Lacunas Go Home Go On Pause Stop Gathering Correct Help About Exit

Overview Pos Number=5061, distance=9.0 (min=9.0)

Knowledge



Note

Shall I go to the Docking Station?

OK

Output

Progress

LR Sonar

Laser

North

Errors

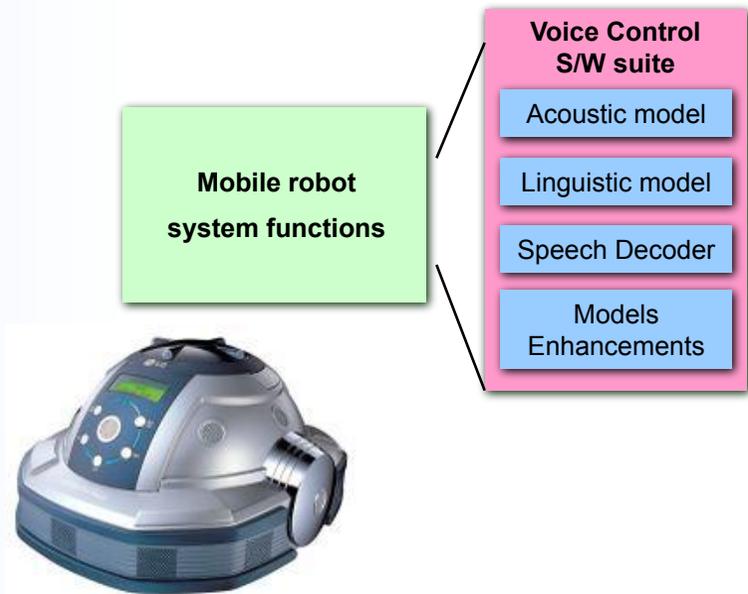
D	A	ON / OFF
<input type="checkbox"/>	<input type="checkbox"/>	Movement
<input type="checkbox"/>	<input type="checkbox"/>	Odometers
<input type="checkbox"/>	<input type="checkbox"/>	LR Sonars

```

target: 24 12
4882:[ 13 ]- 11 -[ 14 ]
target: 24 11
4902:[ 14 ]- 13 -[ 13 ]
target: 25 11
4928:[ 13 ]- 11 -[ 14 ]
target: 25 13
4948:[ 14 ]- 13 -[ 13 ]
target: 26 12
4973:[ 13 ]- 11 -[ 14 ]
target: 26 10
4991:[ 14 ]- 13 -[ 13 ]
target: 27 11
5017:[ 13 ]- 11 -[ 14 ]
5019: Left nothing
      Left wall lost
target: 27 13
5037:[ 14 ]- 13 -[ 13 ]
Work done
    
```

Ready x=1910, y=-350 REAL pos.: X = 1512 Y = 797 A = 82.69 - KNOWN pos.: X = 1505 Y = 790 A = 78.63

Start [Taskbar icons] To... D6... Lin... v4... Roo... 110... En 20:19



EP1386574

US2004034533

JP2004070266

**Voice control apparatus
of vacuum cleaner and
method thereof**

