1) The IR projector in StarGazer™ shoots off infrared rays at the Landmark on the ceiling.

2) And then, the landmark points reflects back the rays to the StarGazer™ on top of a robot.

3) At the same time, the reflected infrared rays turns into an image by CMOS Sensor Array of StarGazer™

4) Through a digital image processing, StarGazer™ calculates the position and angle of a robot by analyzing the acquired image.
INITIAL SETTING
- ALONE MODE
(1 LANDMARK)
ALONE MODE (1 ID)

StarGazer™
Passive Landmark
• CEILING HEIGHT : APPROX 1.8 M

• ID# : 820

• In alone mode, when StarGazer sees other landmark, it will see the another landmark as a center point and coordinate data will be changed to the 2nd landmark.
INITIAL SETTING (LANDMARK)

YOUR PC IS LOCATED IN SOUTH AND LOOKING AT NORTH

TRY TO PUT THE LANDMARKS AS ABOVE
-TO GET THE EXACT HEADING ANGLE DATA
We used **Bluetooth** to communicate between StarGazer and PC.
- You might have to use the wire serial cable for the first time.

**Initial Setting (Comm.)**

- **StarGazer**
- **Receiver (Robot)**
- **Transmitter (PC)**

- Make sure both LEDs are on and Left LED is blinking.
- Blinking means it recognizes the LANDMARK.
- If the landmark type is different it might not blink but it still communicates with PC. If this happens please change to a different ID type!!!
  (e.g. HLD1-S → HLD1-L)
INITIAL SETTING (Monitoring Program)

1. Path: [www.hagisonic.com-Products – 1 – 2 – 3]
2. StarGazerMonitor 1.0904.18: Firmware 2.0904.16 or later
3. StarGazerMonitor v1.0901.07: Firmware 2.0901.07 or later
Please set the **port** and **Baudrate** for your cable or other communication method. (We are using Port (COM5) and Baudrate (115,200) for this test.)

When you finish setting the port, the program will start receiving the data.
When ‘CalcStop’ is clicked, disabled buttons in ‘StarGazer Setting’ are activated.
-This is to prevent data interruption when StarGazer is communicating with PC.
When ‘CalcStart’ is clicked, all the buttons in ‘StarGazer Setting’ are disabled.
1. Click ‘CalcStop’

2. Click ‘Get’ to get the current data

Current data are displayed

StarGazer Setting
- Num of Landmark (for Map mode)
- Reference ID(first ID on Map Mode)
- Landmark Height Fix
  - Yes : use fixed height
    1. Type in the height manually in ‘Landmark height(mm)’
    2. Use ‘HeightMeasure’ button
  - No : StarGazer calculates the height 10 times / sec automatically
- Landmark Height(mm) : for ‘Yes’ mode
- Landmark type : 6 different types
- Mode Setting : Alone mode(1 ID)
  - Map mode(Multiple ID)
- Serial Port Baudrate : Change baudrate
- SetEnd : to set the command
  (Always click this button after changing the data)
- Height Measure : Height measure for ‘Yes’ mode
- Map-building Process(for Multiple ID, Map Mode)
- CalcStart : Restart the process
**ALONE MODE**

**CHANGE THE CURRENT DATA (1/5)**

- **Changing the Current Data**

  1. Input the new data or select it from drop down menu

  2. Click ‘Send’

  3. Always Click ‘SetEnd’ after clicking ‘Send’

  - wait until ‘~!ParameterUpdate’ is displayed on ACK

  4. Click ‘Get’ to see the current or changed data

- **Restart Receiving Data**

  5. Click ‘CalcStart’

Two option for changing data.

1. Change each data by clicking SetEnd every time.
2. Change all the data and press ‘SetEnd’ at the end
1. Click ‘CalcStop’

2. Click drop down menu and select ‘Landmark type’

3. Click ‘SetEnd’

4. wait until ‘~!ParameterUpdate’ is displayed on ACK

- **Landmark Type Change**

- **Landmark Model #**

<table>
<thead>
<tr>
<th>Landmark Model</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>HLD1-S(HLD1-1)</td>
<td>1.1M~2.9M 3X3 (31 id Combination)</td>
</tr>
<tr>
<td>HLD1-L(HLD2-1)</td>
<td>1.1M~2.9M 4X4 (4,095 id Combination)</td>
</tr>
<tr>
<td>HLD2-S(HLD1-2)</td>
<td>2.9M~4.5M 3X3 (31 id Combination)</td>
</tr>
<tr>
<td>HLD2-L(HLD2-2)</td>
<td>2.9M~4.5M 4X4 (4,095 id Combination)</td>
</tr>
<tr>
<td>HLD3-S(HLD1-3)</td>
<td>4.5~6M 3X3 (31 id Combination)</td>
</tr>
<tr>
<td>HLD3-L(HLD2-3)</td>
<td>4.5~6M 4X4 (4,095 id Combination)</td>
</tr>
</tbody>
</table>
1. Click ‘CalcStop’

2. Click drop down menu and select ‘Baudrate’

3. Click ‘SetEnd’

4. ‘~!ParameterUpdate’ will not displayed on ACK.
   (it will not receive data from StarGazer because even StarGazer sends the data PC’s baudrate is different. When you set StarGazer and PC’s baudrate it will start receiving Data)

Default: 115,200
- Using 115,200 is recommended.
- If you change the Baudrate, you have to change the PC’s Baudrate.
- If you use wireless comm., you also, have to change the wireless device’s Baudrate.
ALONE MODE

CHANGE THE CURRENT DATA (4/5)

- CHANGING HEIGHT (OPTION 1)

- Landmark Height Fix: No Mode

1. Click 'CalcStop'

2. Click 'No'

3. Click 'SetEnd'

4. Wait until '~!ParameterUpdate' is displayed on ACK

No Mode
-StarGazer will calculate the ceiling 10 times / sec
- No fixed height
**ALONE MODE**

**CHANGE THE CURRENT DATA (5/5)**

- **CHANGING HEIGHT (OPTION 2)**

  **Landmark Height Fix: Yes Mode**

  1. Type in Manually

  1. Click ‘CalcStop’
  2. Click ‘Yes’
  3. Type ‘ceiling height’ (numbers only)
  4. Click ‘SetEnd’
  5. wait until ‘~!ParameterUpdate’ is displayed on ACK

  **2. Click ‘Height Measure’ Button**

  1. Click ‘Height Measure’
  2. wait until ‘~!ParameterUpdate’ is displayed

**Yes Mode**
- fixed Height is used
- ‘Height Measure’ button:
  - Best result will be given if StarGazer is right below the Landmark
  - StarGazer is calculating height (Height may not be correct since it might have moved from landmark)
MAP MODE
(MAP-BUILDING)
*4 Landmarks(IDs) were used in this test
INITIAL SETTING (ENVIRONMENT)

- 4 LANDMARKS
- CEILING HEIGHT: APPROX 1.8 M
- REF. ID: 820 (FIRST LANDMARK)

Try to place your application right under the first ID. This ID is called Ref. ID(0,0). Other IDs are added to this position. Only 4 IDs (this test) are recognized after map-building.
MAP MODE (PROCEDURE)

STEP 1

1. Click ‘CalcStop’

2. Type ‘Num of Landmark’ (4 for this test)

3. Click ‘Send’

4. Click ‘SetEnd’

5. wait until ‘~!ParameterUpdate’ is displayed on ACK

• Number of Landmark

Num. of Landmark Combination
- 3x3 : up to 31 ids
- 4x4 : up to 4095 ids

StarGazer memorize 4 landmarks in a row and only detects the landmarks.

If there are different number of landmarks, StarGazer might not stop map-building mode.
MAP MODE (PROCEDURE)

**STEP 2**

1. Click ‘CalcStop’

2. Type ‘Ref. ID’ number (820 for this test)

3. Click ‘Send’

4. Click ‘SetEnd’

5. Wait until ‘~!ParameterUpdate’ is displayed on ACK

Reference ID is important because it is the (0,0) coordinate. Map-building is the procedure to add other landmark’s area to the Reference ID. (other 3 landmarks(ID) and area(coordinates) are added to the first landmark(Ref. ID 820) for this test)
STEP 3

MAP MODE (PROCEDURE)

- **Landmark Type Change**
  1. Click ‘CalcStop’
  2. Click drop down menu and select ‘Landmark type’
  3. Click ‘SetEnd’
  4. wait until ‘~!ParameterUpdate’ is displayed on ACK

- **Landmark Model #**

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MAP MODE (PROCEDURE)

STEP 4

CHANGING HEIGHT (OPTION 1)

- Landmark Height Fix: No Mode

1. Click ‘CalcStop’

2. Click ‘No’

3. Click ‘SetEnd’

4. wait until ‘~!ParameterUpdate’ is displayed on ACK

No Mode

- StarGazer will calculate the ceiling 10 times / sec
- No fixed height
### MAP MODE (PROCEDURE)

#### STEP 5

**CHANGING HEIGHT (OPTION 2)**

- **Landmark Height Fix: Yes Mode**
  1. Click ‘CalcStop’
  2. Click ‘Yes’
  3. Type ‘ceiling height’ (numbers only)
  4. Click ‘SetEnd’
  5. Wait until ‘~!ParameterUpdate’ is displayed on ACK

**2. Click ‘Height Measure’ Button**

1. Click ‘Height Measure’
2. Wait until ‘~!ParameterUpdate’ is displayed

---

**Yes Mode**

- **Fixed Height is used**
- **‘Height Measure’ button:**
  - Best result will be given if StarGazer is right below the Landmark
  - StarGazer is calculating height (Height may not be correct since it might have moved from landmark)
MAP MODE (PROCEDURE)

STEP 6

1. Click ‘CalcStop’
2. Click ‘Map’
4. Click ‘SetEnd’
5. Wait until ‘~!ParameterUpdate’ is displayed on ACK

- **Mode Setting**
  - *Alone Mode*: using only 1 Landmark(ID)
    - If it sees another landmark, (0,0) will be move to the second landmark.
  - *Map Mode*: using multiple landmarks(ID)
    - Preset number of landmarks are used
    - It only detects the landmarks which were set in this process. (it doesn’t read other landmarks after the map mode)
STEP 7 – Map-Building Process (Start)

Click ‘Map-building Process’ Button

MAP MODE (PROCEDURE)

IMPORTANT
1. Start from Ref.ID.
2. Slowly move to next ID.
3. Always, StarGazer must Stop in ‘OFFSET area’ for a moment to receive the 2nd ID.
4. After that StarGazer must proceed to 2nd ID area until it doesn’t see the 1st ID.
5. This applies to all the landmarks.
STEP 7-1 – Map-Building Process (Ref. ID)

1. REF.ID : 820

When your application is right under the Ref. ID and ‘Map-building Process Start btn’ is clicked, Data format changes from ‘~^I’ to ‘~^F’ until map-building is finished. (If Ref.ID and actual landmark ID is different, map-building will not start.)
STEP 7-2 – Map-Building Process (2nd ID)

1. Slowly move to your 2nd landmark (822 in this test).
2. Please stop for a moment in between Ref.ID and 2nd ID (OFFSET area).
3. When StarGazer see the 2nd landmark, it will display the landmark data to the Monitoring program.
4. After 1 is recognized, please move forward until 2 is recognized and displayed (820→822).
5. Proceed to next Step.
1. Slowly move to your 3rd landmark (832 in this test).
2. Please stop for a moment in between 2nd ID and 3rd ID (OFFSET area).
3. When StarGazer see the 3rd landmark, it will display the landmark data to the Monitoring program.
4. After 1 is recognized, please move forward until 2 is recognized and displayed (822→832).
5. Proceed to next Step.
STEP 7-3 – Map-Building Process (4th ID)

1. Slowly move to your 4th landmark (834 in this test).
2. Please stop for a moment in between 3rd ID and 4th ID (OFFSET area).
3. When StarGazer see the 4th landmark, it will display the landmark data to the Monitoring program.
4. After 1 is recognized, please move forward until 2 is recognized and displayed (822→832).
5. Also, it will finish the map-building (Data ‘~^F’ changes to ‘~^I’ in ‘Calc Data’ and ‘~!ParameterUpdate’ is displayed).
• Now, starting from Ref.ID(820) all the IDs(822,832,834) and location information is stored in StarGazer.
• StarGazer will not recognize any other landmarks(IDs) since it stored only 4 IDs.
• Landmark order and number of landmarks can be changed.
FOR TECHNICAL SUPPORT, PLEASE EMAIL US

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