

Overview

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This section documents all visual stimulus patterns used in the freely-walking optomotor experiments on the G3 LED arena.

1 Pattern Categories

The patterns are organized into several categories based on their visual properties and experimental purpose:

Category	Description	Example Patterns
Optomotor Gratings	Moving vertical stripe patterns for motion detection	Pattern 06 (8px), Pattern 09 (16px)
Flicker	Temporal contrast without spatial motion	Pattern 10, Pattern 07
Curtains	Progressive edge stimuli (ON/OFF)	Pattern 19, Pattern 20, Pattern 51-52
Reverse Phi	Contrast-reversing apparent motion	Pattern 31-33, Pattern 58-62
Bar Fixation	Stationary bars for phototaxis	Pattern 30, Pattern 37-46
Background	Uniform patterns for intervals	Pattern 47, Pattern 25

2 Pattern Overview

Pattern	Name	Type
01	optomotor_contrast_72_RC	Optomotor Grating
02	flicker_72_RC	Flicker
03	optomotor_shifted_centre	Optomotor Grating
04	optomotor_4pixel_binary	Optomotor Grating
05	flicker_4pixel_binary	Flicker
06	optomotor_8pixel_binary	Optomotor Grating
07	flicker_8pixel_binary	Flicker
08	optomotor_8pixel_shifted_binary	Optomotor Grating
09	optomotor_16pixel_binary	Optomotor Grating
10	flicker_16pixel_binary	Flicker
11	optomotor_skinny_2ON_6OFF_binary	Optomotor Grating
12	flicker_2ON_6OFF	Flicker

Pattern	Name	Type
13	optomotor_skinny_4ON_12OFF_binary	Optomotor Grating
14	flicker_4ON_12OFF	Flicker
15	optomotor_wide_6ON_2OFF_binary	Optomotor Grating
16	optomotor_wide_12ON_4OFF_binary	Optomotor Grating
17	optomotor_skinny_2ON_14OFF_binary	Optomotor Grating
18	flicker_2ON_14OFF	Flicker
19	ON_curtains_16px	ON Curtain
20	OFF_curtains_16px	OFF Curtain
21	0-8shift_60deg_1-875step	Shifted Center
22	0shift_60deg_1-875step	Shifted Center
23	minus0-8shift_60deg_1-875step	Shifted Center
24	optomotor_skinny_2OFF_14ON_binary	Optomotor Grating
25	bkg_3_gsva4_2frames	Background
26	optomotor_8pixel_binary_2pxsteps	Optomotor Grating
27	optomotor_16pixel_binary_2pxsteps	Optomotor Grating
28	optomotor_skinny_2ON_14OFF_binary_2pxsteps	Optomotor Grating
29	bkg_1_gsva4_2frames	Background
30	4px_bar_fixation	Bar Fixation
31	RevPhi_0_3_8_1px_step	Reverse Phi
32	RevPhi_0_3_8_4px_step	Reverse Phi
33	RevPhi_0_3_8_8px_step	Reverse Phi
34	FoE_1-875_step_30deg	Focus of Expansion
35	FoE_1-875_step_15deg	Focus of Expansion
36	FoE_1-875_step_60deg	Focus of Expansion
37	8px_bar_fixation_OFF	Bar Fixation (OFF)

Pattern	Name	Type
38	8px_bar_fixation_ON	Bar Fixation (ON)
39	8px_bar_fixa- tion_ON_2con	Bar Fixation (ON)
40	8px_bar_fixa- tion_ON_4con	Bar Fixation (ON)
41	8px_bar_fixa- tion_ON_6con	Bar Fixation (ON)
42	8px_bar_fixa- tion_OFF_2con	Bar Fixation (OFF)
43	8px_bar_fixa- tion_OFF_4con	Bar Fixation (OFF)
44	8px_bar_fixa- tion_OFF_6con	Bar Fixation (OFF)
45	16px_bar_fixation_ON	Bar Fixation (ON)
46	16px_bar_fixation_OFF	Bar Fixation (OFF)
47	bkg_0_gsvall_2frames	Background
48	full_flashes_0_1_bi- nary_2frames	Full Field Flash
49	16px_bar_fixa- tion_OFF_3con	Bar Fixation (OFF)
50	16px_bar_fixa- tion_ON_3con	Bar Fixation (ON)
51	ON_curtains_32px	ON Curtain
52	OFF_curtains_32px	OFF Curtain
53	ON_curtains_32px_4_9	ON Curtain
54	ON_R_cur- tains_32px_4_9	ON Curtain
55	OFF_cur- tains_32px_4_0	OFF Curtain
56	OFF_R_cur- tains_32px_4_0	OFF Curtain
57	32px_single_bar_ON	Other
58	RevPhi_gsvall3_0_3_7_8- 24px_4px_step	Reverse Phi
59	RevPhi_gsvall3_0_3_7_16- 16px_4px_step	Reverse Phi
60	RevPhi_gsvall3_0_3_7_16- 16px_8px_step	Reverse Phi
61	RevPhi_gsvall3_0_2_7_16- 16px_4px_step	Reverse Phi

Pattern	Name	Type
62	RevPhi_gsval2_0_1_3_16-Reverse Phi 16px_4px_step	
63	optomotor_4pixel_bi- nary_2pxsteps	Optomotor Grating

3 Pattern Gallery

Below is a gallery of all patterns. Click on any pattern number in the table above to see detailed information including animated previews.

i Note

Patterns are displayed as they appear on the cylindrical LED arena (3 rows x 192 columns of LEDs), scaled up for visibility.

4 Adding a New Pattern

When you create a new pattern for the LED arena, follow these steps to add it to this documentation:

4.1 Step 1: Create the Pattern File

Create your pattern using MATLAB. Pattern generation scripts are located in:

`freely-walking-optomotor/script_to_make_patterns/`

Your pattern file should follow the naming convention: `Pattern_XX_descriptive_name.mat`

The pattern struct should contain:

- `pattern.Pats` - 3D or 4D array of pixel values
- `pattern.x_num` - Number of animation frames
- `pattern.y_num` - Number of contrast levels (usually 1)
- `pattern.gs_val` - Greyscale value (1=binary, 2=4-level, 3=8-level, 4=16-level)
- `pattern.num_panels` - Number of panels (72)

4.2 Step 2: Generate Documentation

From the `freely-walking-optomotor` directory, run:

```
cd /path/to/freely-walking-optomotor
pixi run -e default --manifest-path python/freely-walking-python/pixi.toml \
  python docs_generator/generate_pattern_docs.py \
  patterns/Patterns_optomotor/Pattern_XX_your_pattern.mat
```

This will:

1. Generate PNG frames and an animated GIF in `reiser-documentation/assets/imgs/freely/patterns/`
2. Create a `.qmd` documentation page in `reiser-documentation/Freely-walking/`

4.3 Step 3: Update Navigation

Add your new pattern to `reiser-documentation/_quarto.yml` under the Patterns section:

```
- section: "Patterns"
  contents:
    - Freely-walking/freely_walking_patterns_index.qmd
    - Freely-walking/freely_walking_pattern_XX.qmd # Add your pattern here
```

4.4 Step 4: Preview and Deploy

```
cd /path/to/reiser-documentation
quarto preview
```

Once satisfied, commit and push to deploy.

5 Regenerating All Pattern Documentation

To regenerate documentation for all patterns:

```
cd /path/to/freely-walking-optomotor
pixi run -e default --manifest-path python/freely-walking-python/pixi.toml \
  python docs_generator/generate_pattern_docs.py
```

6 Technical Details

6.1 Arena Geometry

- **Display:** Cylindrical LED arena with 72 panels
- **Resolution:** 3 rows x 192 columns (each panel is 8x8 pixels)
- **Panel arrangement:** `fliplr(flipud(reshape(1:72, 3, 24)))`

6.2 Greyscale Levels

gs_val	Levels	Use Case
1	2 (binary)	High contrast patterns
2	4	Low contrast experiments
3	8	Reverse phi, intermediate contrast
4	16	Fine contrast gradients