# SLStudio User Manual

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# Required Software

- QT Creator 5.9.5

- Point Cloud Library (PCL) 1.8

- OpenCV OpenCV 3.2.0

- ROS with the following packages
  - Versavis (devel/sl_sensor branch from [forked repo](#))
  - flir_camera_driver (devel/sl_sensor branch from [forked repo](#))

# Running SLStudio

- Start Versavis to begin image acquisition
  - If using hardware trigger:
    - In versavis_configuration.h, change the camera trigger frequency based on the type of pattern used (PSP+TPU or 2P1 with TPU). Header file has comments to indicate with lines of code to comment/uncomment
  - Upload versavis.ino onto the board
  - In a terminal, run the code
    - roslaunch versavis sls_run_versavis.launch
- Launch SLStudio
  - In a separate terminal (need to be launch for a terminal to run properly with ROS), run
    - qtcreator
  - Open the SLStudio project in qtreator
  - Press Run (Large green triangle)

# Main Menu



SLStudio → Preferences

Go to calibration screen

**SLStudio**

SLStudio   Scan   Calibration   View

Start Scan   Stop Scan   |   Save Point Cloud   Save Screenshot   Perform Calibration   |

Start scanning

Start/stop projecting patterns (without scanning). Projected pattern specified by Preferences

Grab images for linearity response testing

Generate patterns to upload onto projector

Linearity Test   Generate Patterns   Start Projector   Stop Projector
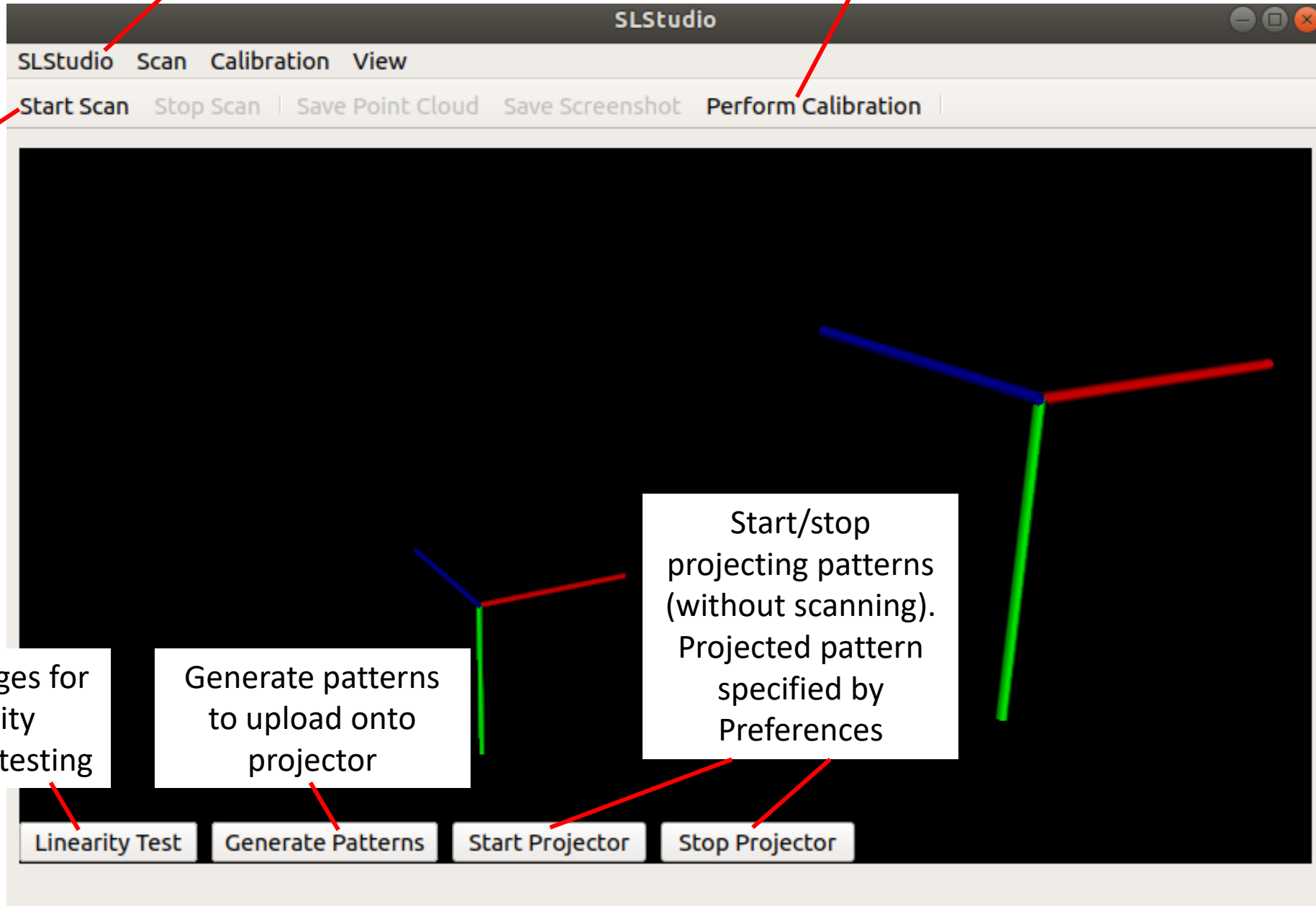
# Preferences

Pattern to be projected. Currently only supports:
- 2x3 Pattern Phase Shift
- 2+1 Pattern with TPU

Project vertical and/or horizontal patterns. Note 2+1 TPU only supports vertical or horizontal, but not both together

Check this because Lightcrafter has a diamond pixel arrangement

Shutter option is currently not in use, exposure time is managed by flir_camera_driver ROS package and is set to 16.667ms



When Start Scan is pressed:
1) Continuous: Whether to keep scanning until Stop Scan is pressed
2) Single Point Cloud: just scan once

Currently only supports the combination
Projector: LC4500 Versavis API
Camera: ROS driver

Hardware or software triggered (Camera is always hardware triggered, but projector is software triggered)

For software trigger, amount of delay between grabbing of next image

Whether to save the captured images/point cloud. Tracking data is currently not used

# Calibration



All captured sequences, untick low quality sequences to remove them from the calibration process

Screen showing Live View / Processed Calibration images

Calibration board grid size

Row and columns of calibration board (# of grid intersections)

Press Calibrate to estimate sensor intrinsics/extrinsics

Snap to take a sequence of calibration images

Press Save once you are satisfied with the results. Results will be saved in the file calibration.xml

# Post-Calibration Steps

1. Once calibration has been done, press 'Generate Patterns' in the main menu

2. Upload the generated patterns onto the Lightcrafter projector using the steps in pattern_upload_instructions.pdf

# Linearity Testing

1. Upload the DLPR350PROM_v4.1.0_with_cali_linearity_test.bin firmware onto the projector using the [lightcrafter_4500_gui](#)

2. Press 'Linearity Test' in the main menu

3. Projector will project fully illuminated images of increasing intensity and the camera will take pictures of them

4. Use the 'utiliy/linearity_test.m' script in [phase_shifting_profilometry_matlab](#) to evaluate the captured images