Stereo vision

two aligned cameras plus neural depth perception—to determine 3D depth and spatial structure. Proces depth through software algorithms rather than laser-based sensing.

- Stereo Vision Basics
- Zed 2i
- OAK-D (Lite)

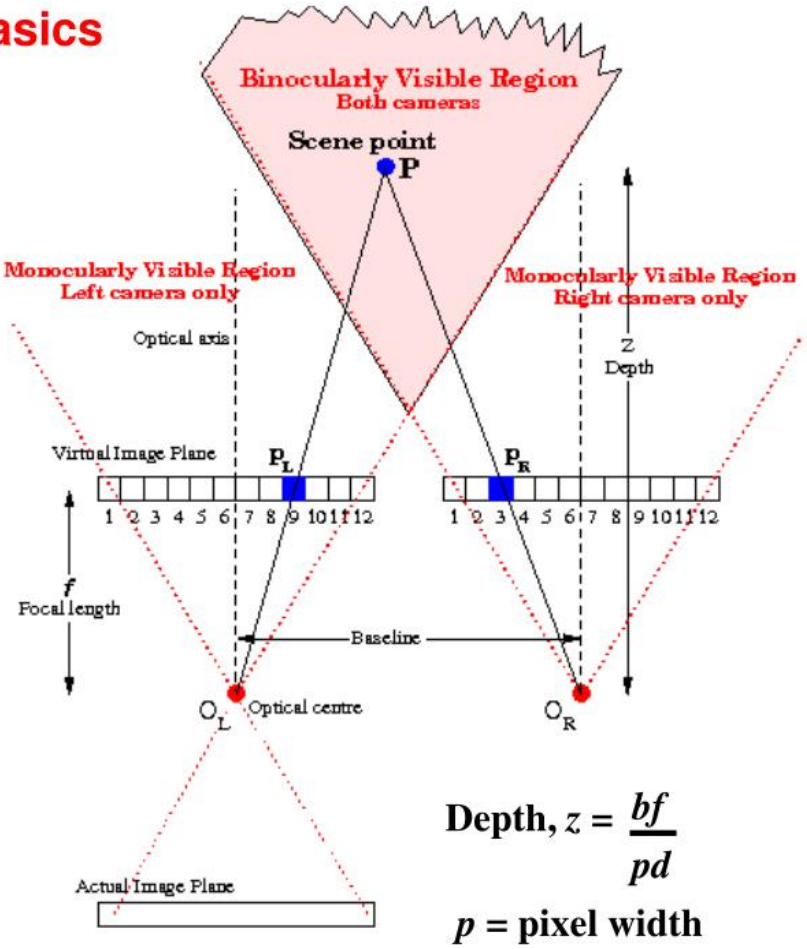
Stereo Vision Basics

Stereo Vision - Basics

Two cameras: Left and Right
Optical centres: O_L and O_R
Virtual image plane is projection of actual image plane through optical centre
Baseline, b, is the separation between the optical centres
Scene Point, P, imaged at p_L and p_R

$p_L = 9$
$p_R = 3$
Disparity, d = $p_R - P_L = 6$

Disparity is the amount by which the two images of P are displaced relative to each other



Depth, $z = \frac{bf}{pd}$

p = pixel width

Zed 2i

ZED 2i is an IP66-rated Rolling Shutter camera built for spatial analytics and immersive experiences, powered by Neural Depth Engine 2. Ready to deploy, it has a robust aluminum enclosure, high-performance IMU and USB 3.1 connection.

ALL the info on ZED camera's

Works on PC only

How to install: https://www.stereolabs.com/docs/installation/windows

Main Features

1. **Dual-Lens Stereo Vision:** Provides advanced depth perception and 3D mapping capabilities.
2. **Spatial Understanding:** Offers a detailed understanding of the surrounding environment.
3. **Motion Tracking:** Tracks objects and people in real-time with high accuracy.
4. **High-Resolution Imaging:** Captures high-quality images, essential for detailed visual work.
5. **Robust Build:** Designed for a variety of environments, enhancing versatility.
6. **Integrated Sensors:** Includes IMU, barometer, and magnetometer for comprehensive data collection.
7. **Flexible Connectivity:** USB 3.1 connection for easy integration with various systems.

Here are the links to the TouchDesigner documentation regarding ZED TOP, CHOP and SOP:

TOP: https://docs.derivative.ca/ZED_TOP

CHOP: https://docs.derivative.ca/ZED_CHOP

SOP: https://docs.derivative.ca/ZED_SOP

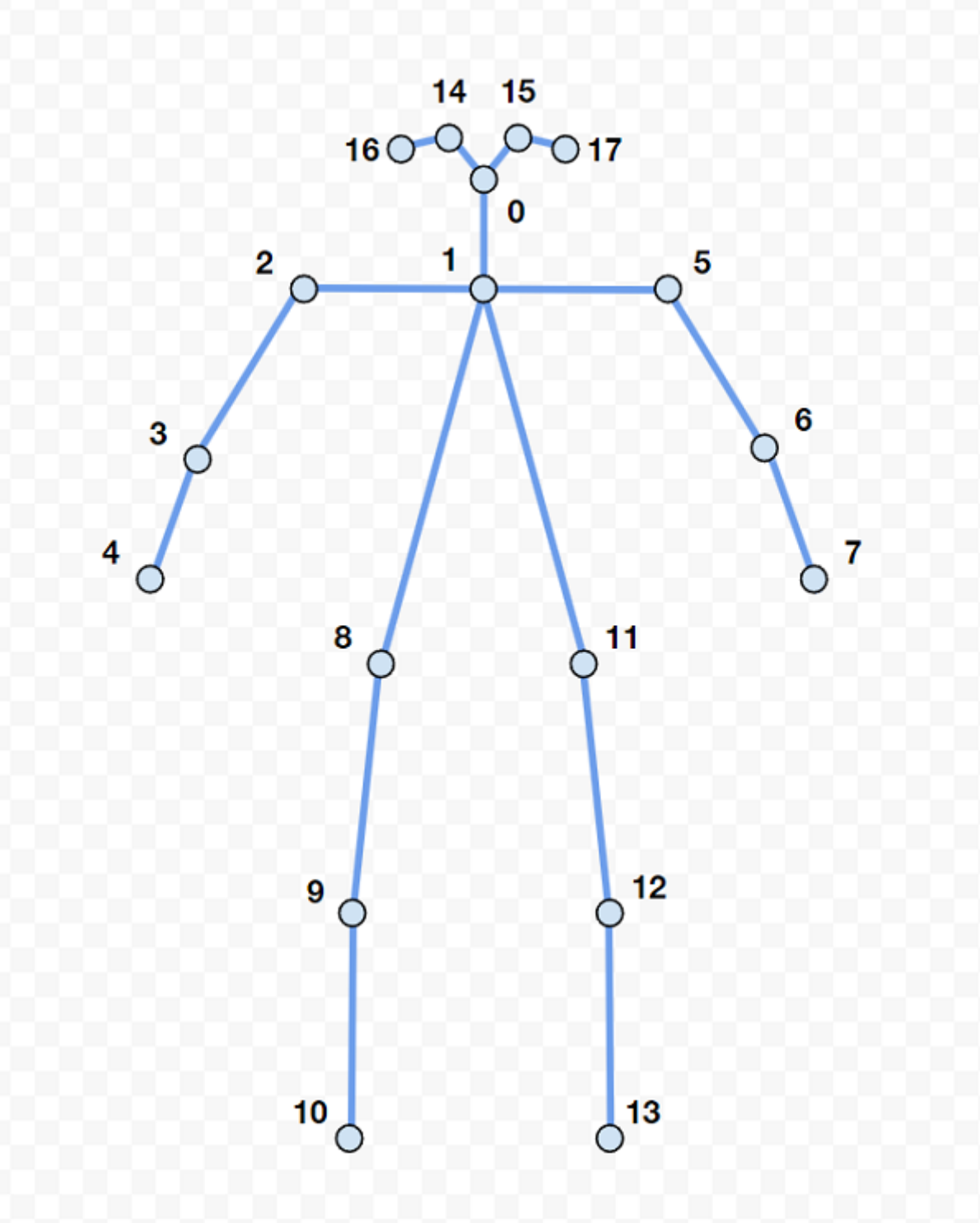
Also, if this is a topic of your interest, it might come in handy to have a look at the official ZED documentation:

https://www.stereolabs.com/docs

more info on https://interactiveimmersive.io/blog/touchdesigner-integrations/updated-zed-camera-

features-in-touchdesigner/

Skeleton tracking keypoints (there are various options)



https://www.youtube.com/embed/TGmSyy0VVq4

https://www.youtube.com/embed/bJVzg6q21lg

https://interactiveimmersive.io/blog/touchdesigner-integrations/updated-zed-camera-features-in-touchdesigner/

OAK-D (Lite)

A small depth camera that combines **stereo vision** with an onboard **AI processor.**
The **OAK-D** can be used for 3D scanning because it produces **RGB + depth maps** that you can turn into a point cloud and mesh. You move the camera around an object or space, capture overlapping frames, and then stitch them together with software (e.g. Open3D, MeshLab, or ROS).

But: it's **not the preferred tool** for 3D scanning.

- Accuracy is lower than LiDAR or photogrammetry.
- Shiny/transparent surfaces don't scan well.
- Range is limited (~10 m).

It's great for **real-time depth perception and robotics**, but for **high-quality 3D models** you'd usually go with photogrammetry or LiDAR.

- **How it works:**
  - Two synchronized monochrome cameras capture slightly different views of the same scene.
  - Depth is computed by comparing the disparity (shift) between the two images.
  - An onboard neural depth engine accelerates the calculations, so the host computer doesn't have to.
  - Optionally, an RGB camera provides color overlays on the depth map.
- **Key features:**
  - Depth range: ~0.3 m – 10 m.
  - Field of view: ~70–80°.
  - USB-C powered, plug-and-play.
  - Runs AI models (object detection, face recognition, body pose estimation) **directly on the device**.
- **Why it matters for stereo vision:**
  - Demonstrates that stereo vision can be compact, affordable, and real-time.
  - Doesn't need external GPUs/CPUs for heavy lifting.
  - Provides a good bridge between basic stereo rigs (like DIY dual webcams) and advanced research hardware (like ZED cameras).
- **Use cases:**
  - Robotics navigation.
  - Human pose tracking.
  - AR/VR prototyping.
  - Object recognition combined with depth.

Here's info on how to use it in Touchdesigner: https://derivative.ca/UserGuide/OAK-D
The example file is `OAKExamples.toe`. Instructions and tips are inside the file. The file is located in `C:/Program Files/Derivative/TouchDesigner.2023.xxxxx/Samples/OAK`.