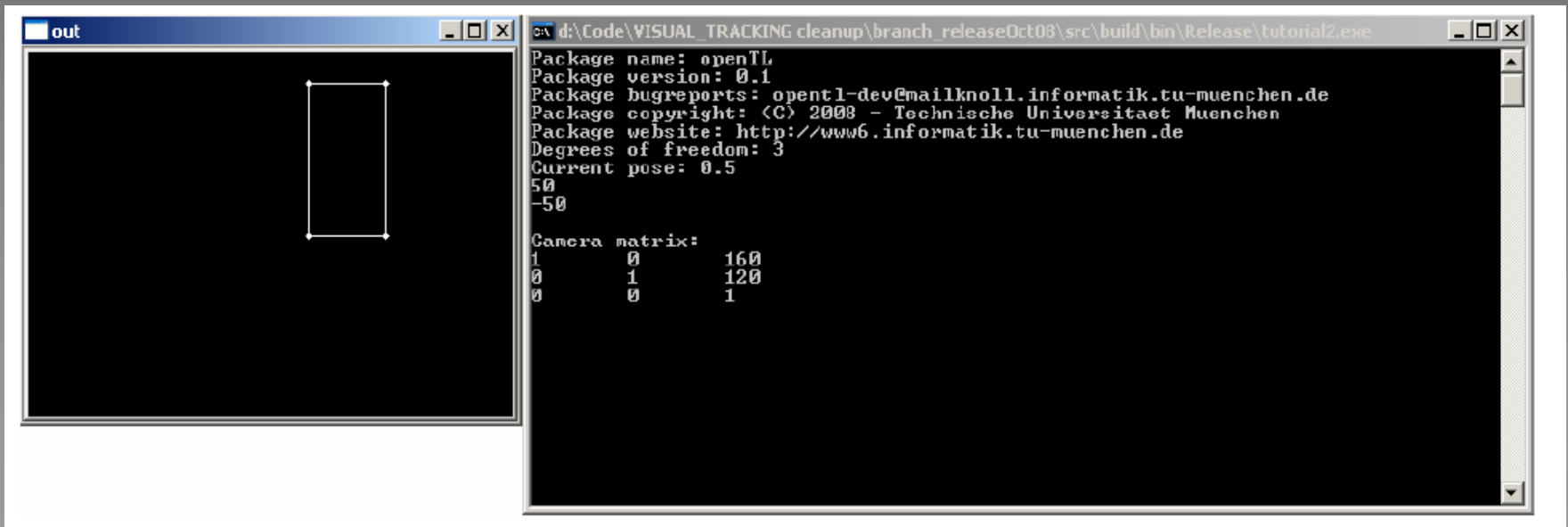
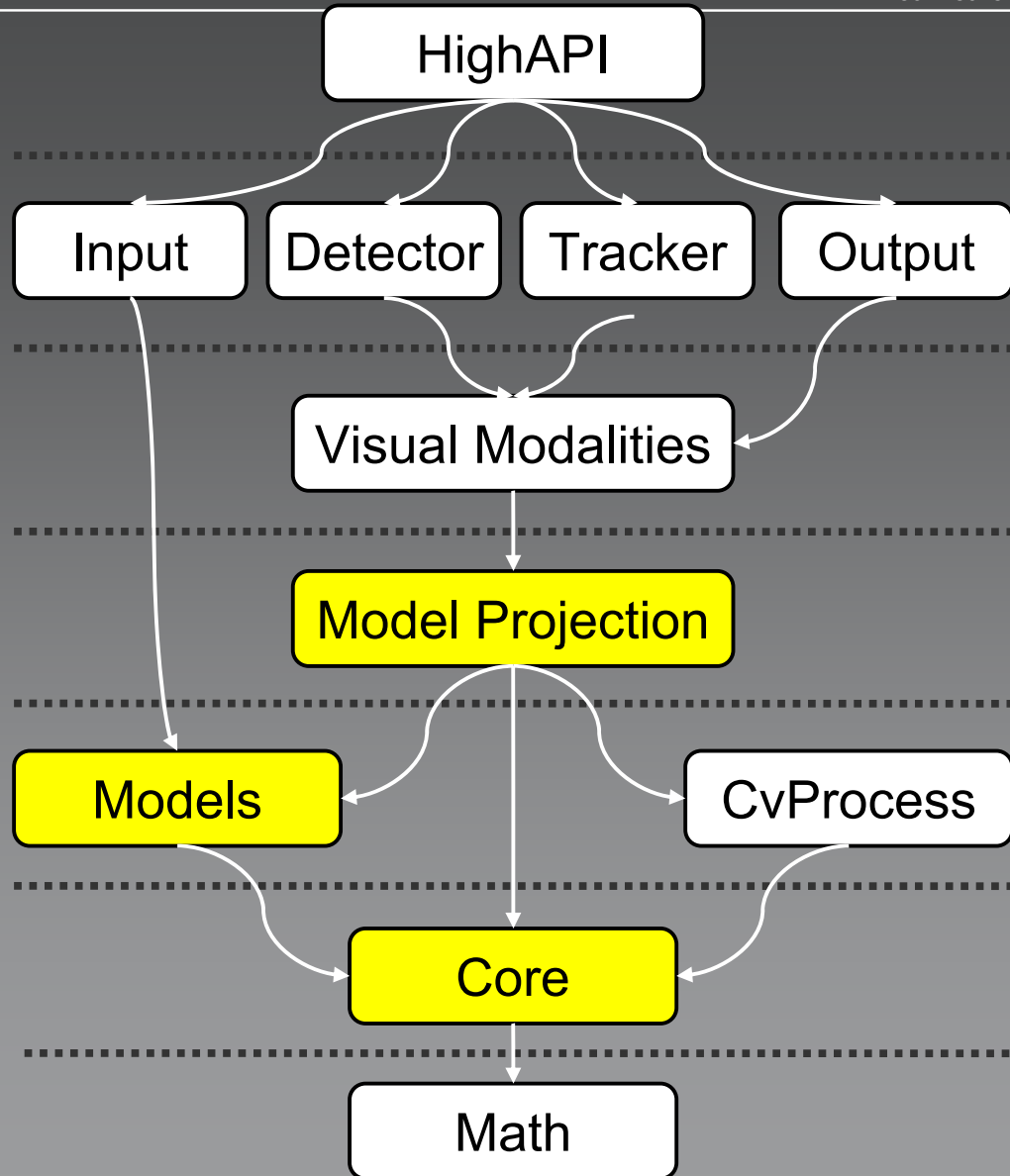


OpenTL – Tutorial 2

- Projecting points to screen using a pose-representation



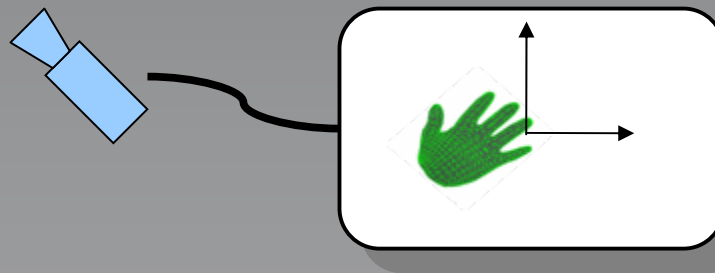
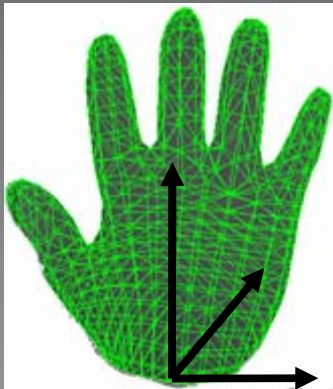


Model Projection – Warp

- Mapping from object to screen homogeneous coordinates:

$$\bar{y} = K \cdot T \cdot \bar{x}$$

$$y = \begin{bmatrix} \frac{\bar{y}_1}{\bar{y}_3} & \frac{\bar{y}_2}{\bar{y}_3} \end{bmatrix}^T$$



Model Projection - Warp

- Managing the relationship between object and camera spaces
→ `modelprojection::Warp warp(sensVector)`
- Update internal camera matrices and Jacobians whenever the state vector changes
→ `warp.warpUpdate(stateVec)`

Models – Sensor Model

$$\bar{y} = K \cdot T \cdot \bar{x}$$

- models::SensorModel sensor

→ K-Matrix

$$K = \begin{bmatrix} 1 & 0 & 0 & r_x/2 \\ 0 & 1 & 0 & r_y/2 \\ 0 & 0 & 0 & 1 \end{bmatrix}$$

2D → focus=1

- Internal camera parameters

→ sensor.setK(focus, xres, yres);

- Support of multiple cameras

→ std::vector<models::SensorModel *> sensVector;

Core

$$\bar{y} = K \cdot T \cdot \bar{x}$$

- cvdata::Pose2d1ScaleTranslation pose
→ T-Matrix

$$T = \begin{bmatrix} s & 0 & 0 & t_x \\ 0 & s & 0 & t_y \\ 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix}$$

- 3 degrees of freedom
→ 1 scale, 2 translation

Models – Object State

- `models::State(NULL, &pose, false, false)`



3D Model Shape

Model Appearance

Tutorial 3

Models – Object State

- Support of multiple objects
→ Multiple States!

- Use of a vector of states:

```
std::vector<boost::shared_ptr<opentl::models::State> >
```

- Set the data of the state:

```
stateVec[0]->setDataFromSingleVector(&pose data);
```

```
math::Vector pose_data(dof);  
pose_data[0] = 1;  
pose_data[1] = 50;  
pose_data[2] = -50;
```


Task – Project 4 object points to the screen

- Define 4 object points in homogeneous coordinates (4 dof)
- Define the 4 resulting screen coordinates (2 dof)
- Warp the points with: *warpPoint*
 - `warp.warpPoint(*stateVec[0]->getPos(), &objP1, &screenP1);`
- Show the points in a `cvdata::Image`
 - use OpenCV methods *CvPoint*, *CvLine*

