



Workshop

Energy infrastructure
resilience in response
to war and other hazards

23–26 September 2024

Rzeszów, Poland

Use of VR for remote control of robotic arm

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Science for Peace and Security (2024)
Energy infrastructure resilience in response to war and other hazards
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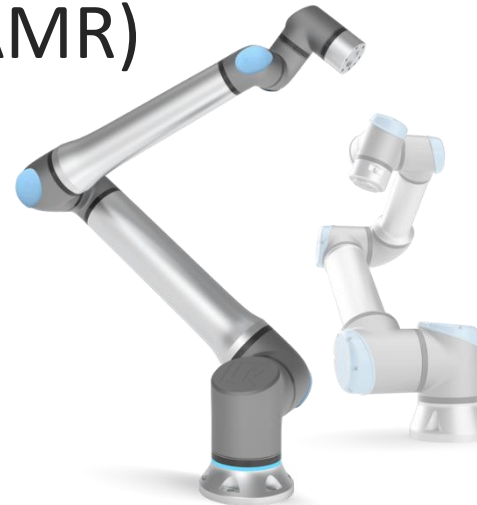
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Robot - a machine that can perform a complicated series of tasks by itself.

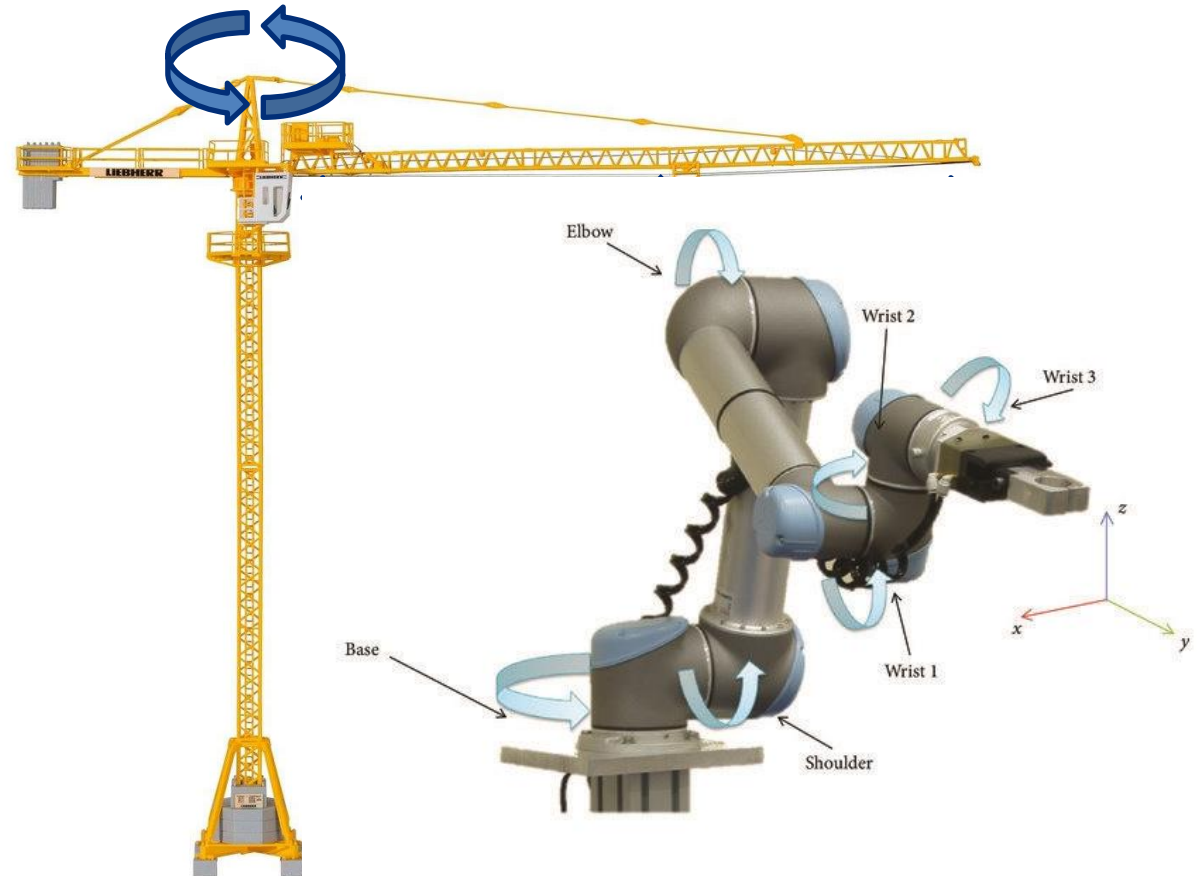


Types of Robots:

- Autonomous Mobile Robots (AMR)
- Articulated Robots
- Cobots
- Humanoids
- Hybrids



- **Degrees of Freedom (DOF)**
- Forward kinematics
- Inverse kinematics



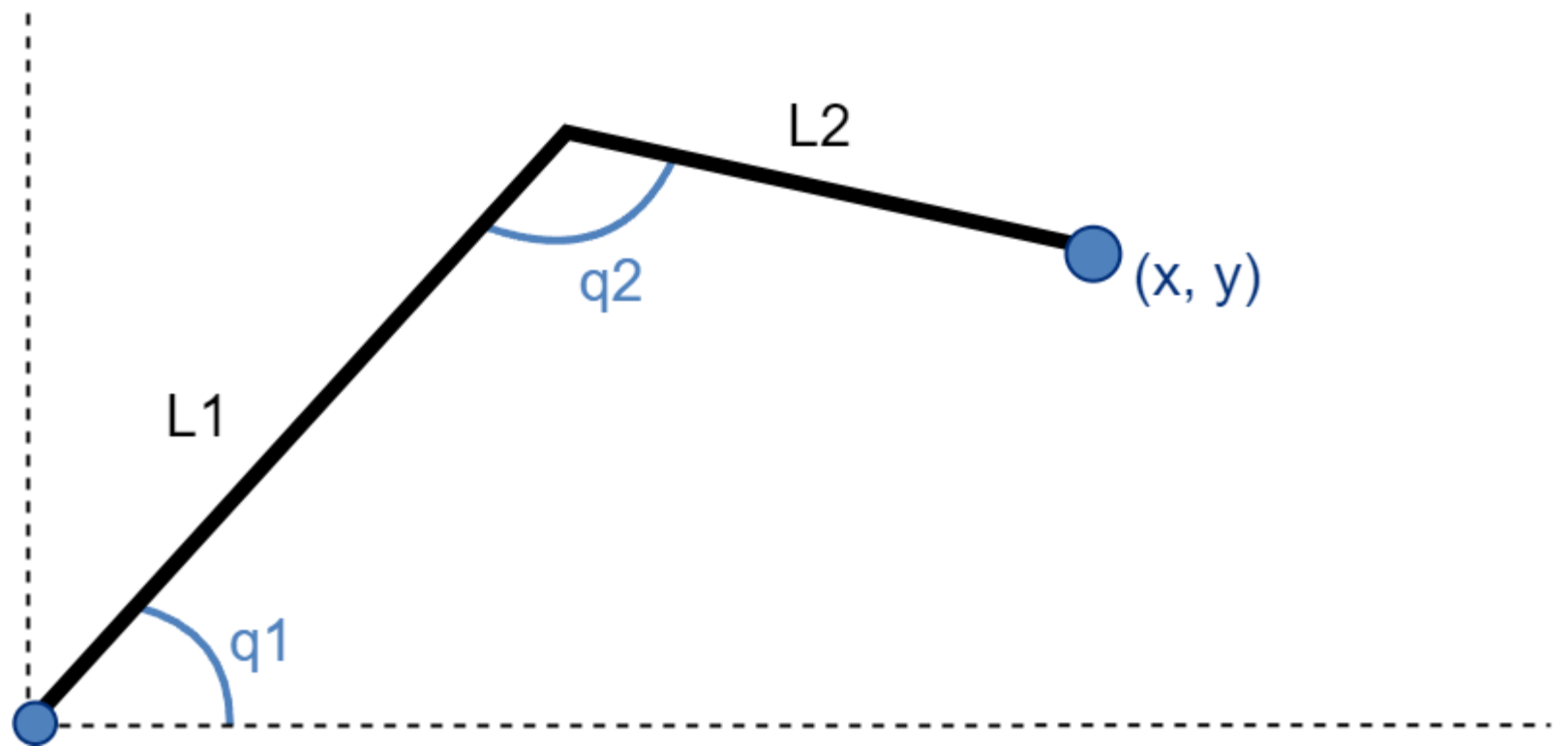
- Degrees of Freedom (DOF)
- **Forward kinematics**
- Inverse kinematics

Known:

- L1, L2
- q_1, q_2

Unknown:

- x, y



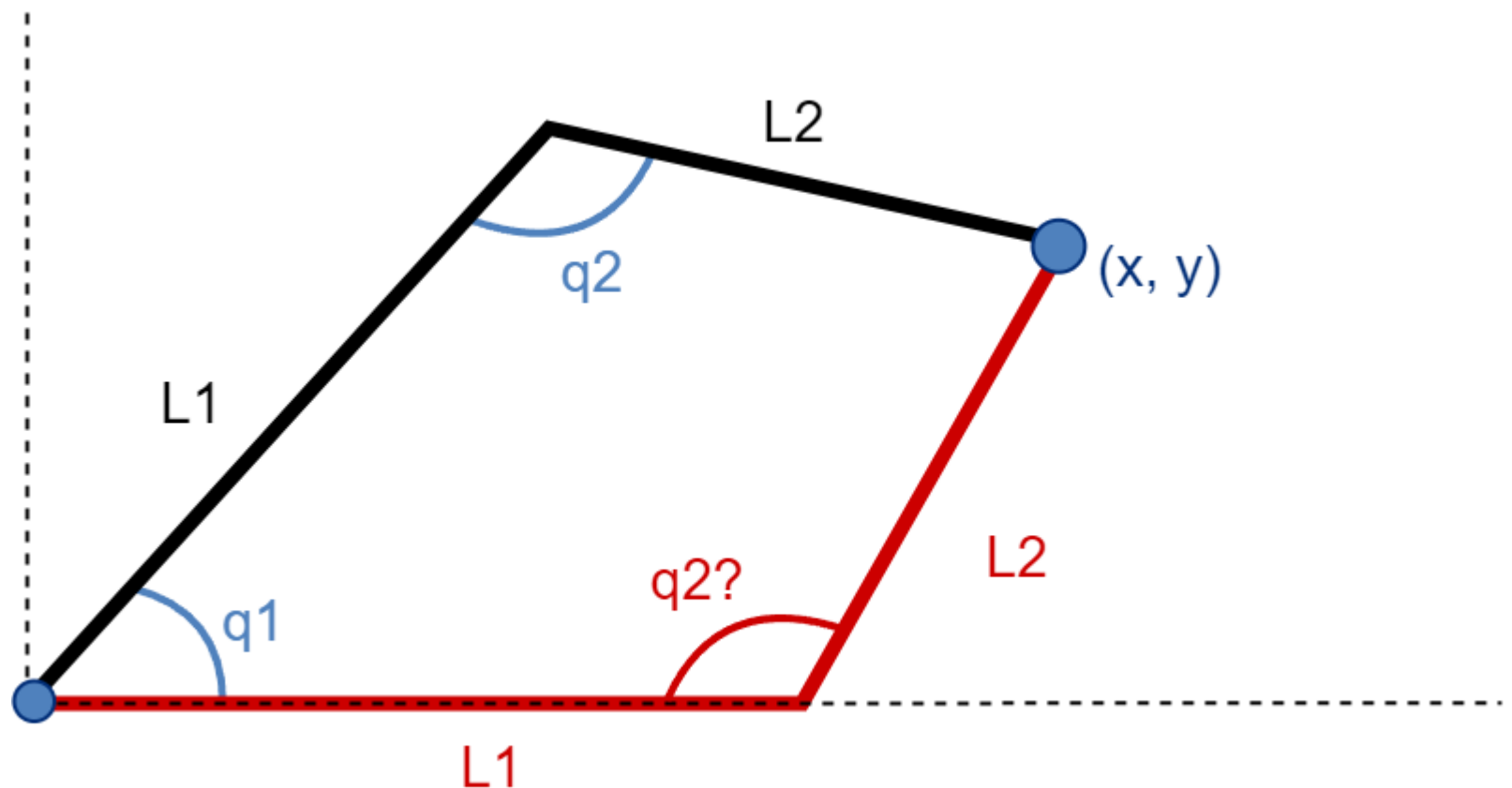
- Degrees of Freedom (DOF)
- Forward kinematics
- **Inverse kinematics**

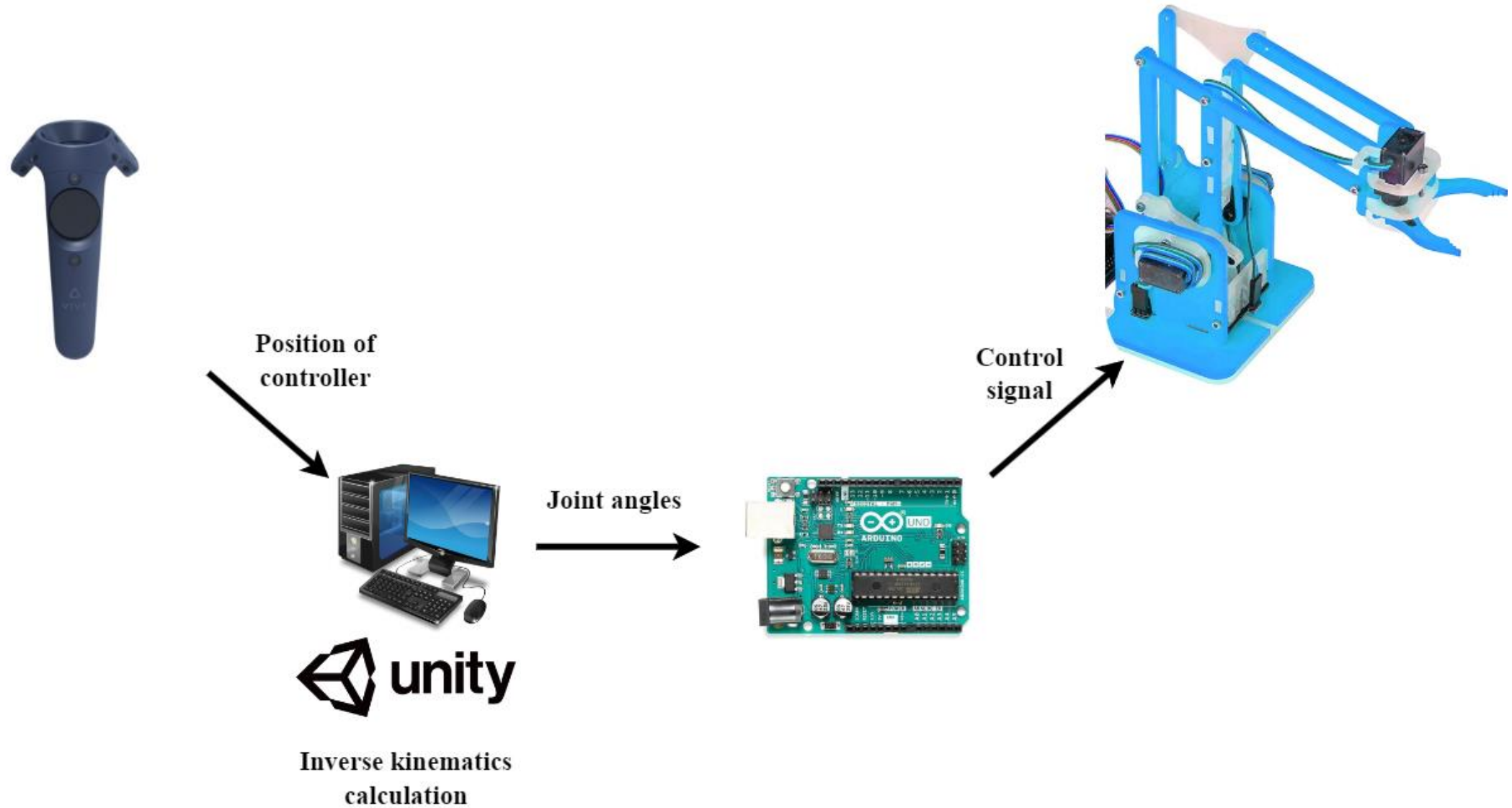
Known:

- L1, L2
- x, y

Unknown:

- $q1, q2$







Arkadiusz Stęchty
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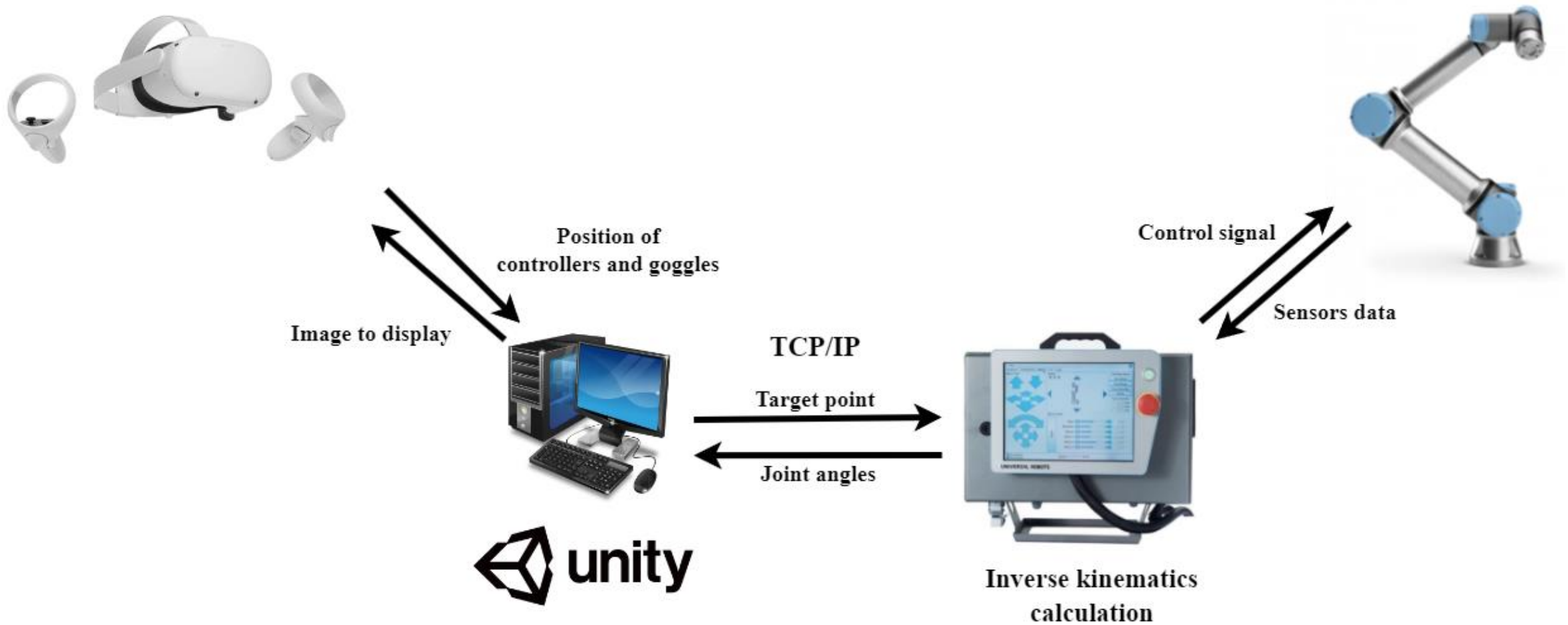
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Noticed problems ...

- Inverse kinematics are hard;
- It's hard to judge arm position;
- Strange behavior for invalid position;

... and solutions to them

- Just don't calculate them;
- Use camera image and digital double;
- Same as the first dot;



Visualization of the target arm position

Noticed problems ...

- Relying on someone else's inverse kinematics calculation is too restrictive;
- One camera is not enough;

... and solutions to them

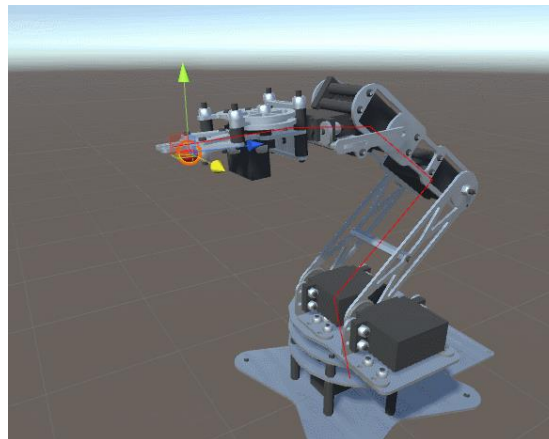
- Use in engine robot animation;
- Two camera system;

Future development ideas

Stereo vision



In engine animation systems for IK



Two arms



Potential uses of technology

Bomb defusal - Taurus



Robotic doctors



Search and rescue - Saphi



Thank you for your attention