

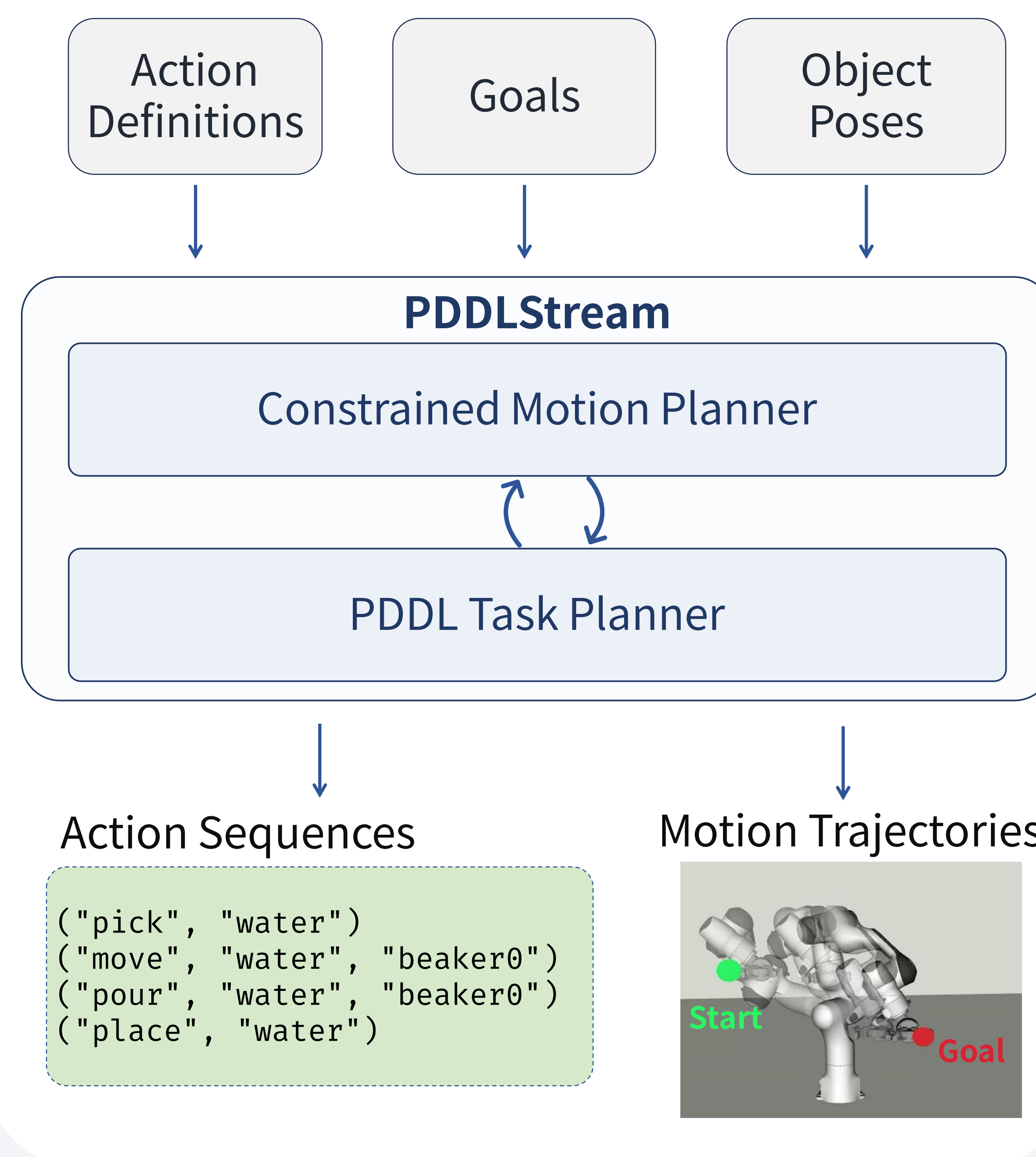
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Alán Aspuru-Guzik, Animesh Garg, Florian Shkurti

High Level Instruction

Written in Chemical description language (XDL)

```
<XDL>
<Synthesis>
<Hardware>
  <Component id="beaker0" type="beaker"/>
</Hardware>
  Hardware definition
<Reagents>
  <Reagent name="water"/>
  <Reagent name="salt"/>
</Reagents>
  Reagent definition
<Procedure>
  <Add vessel="beaker0" reagent="salt" amount="10 g"/>
  <Repeat>
    <Add vessel="beaker0" reagent="water" amount="10 g"/>
    <Stir vessel="beaker0"/>
    <Monitor target="beaker0" quantity="turbidity">
  </Repeat>
  </Procedure>
</Synthesis>
</XDL>
  Experimental procedure
```

Task and Motion Planning



Automated Experiment

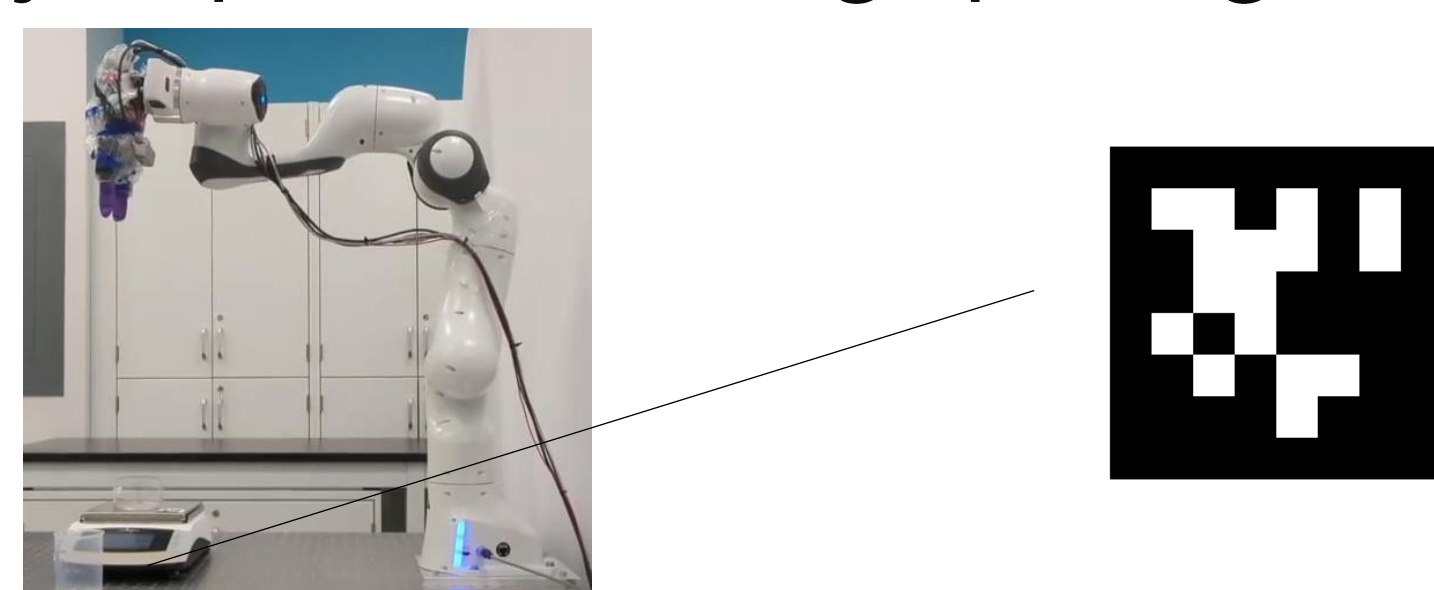


Chemistry Lab Skills

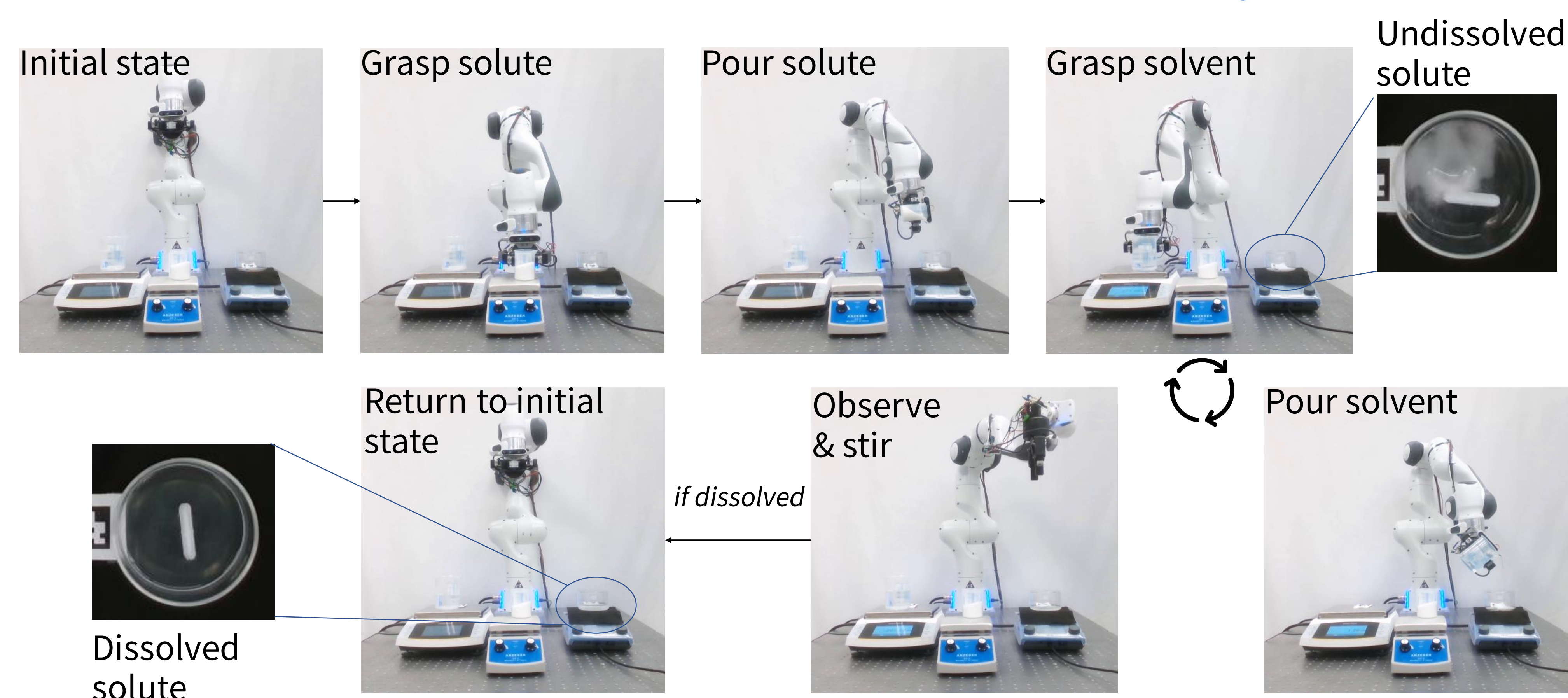


Perception

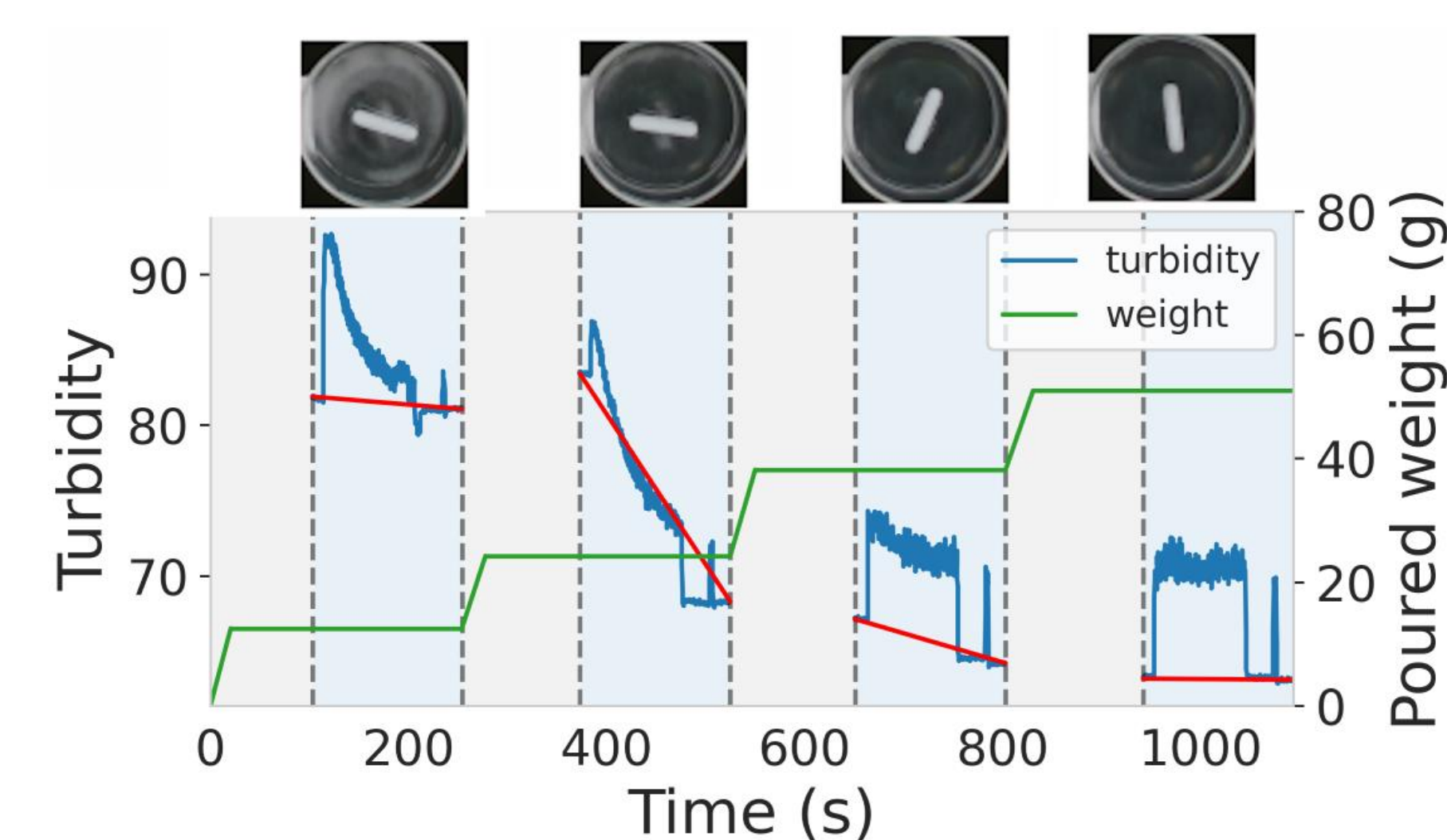
Detect object positions using AprilTag



Solubility Measurement



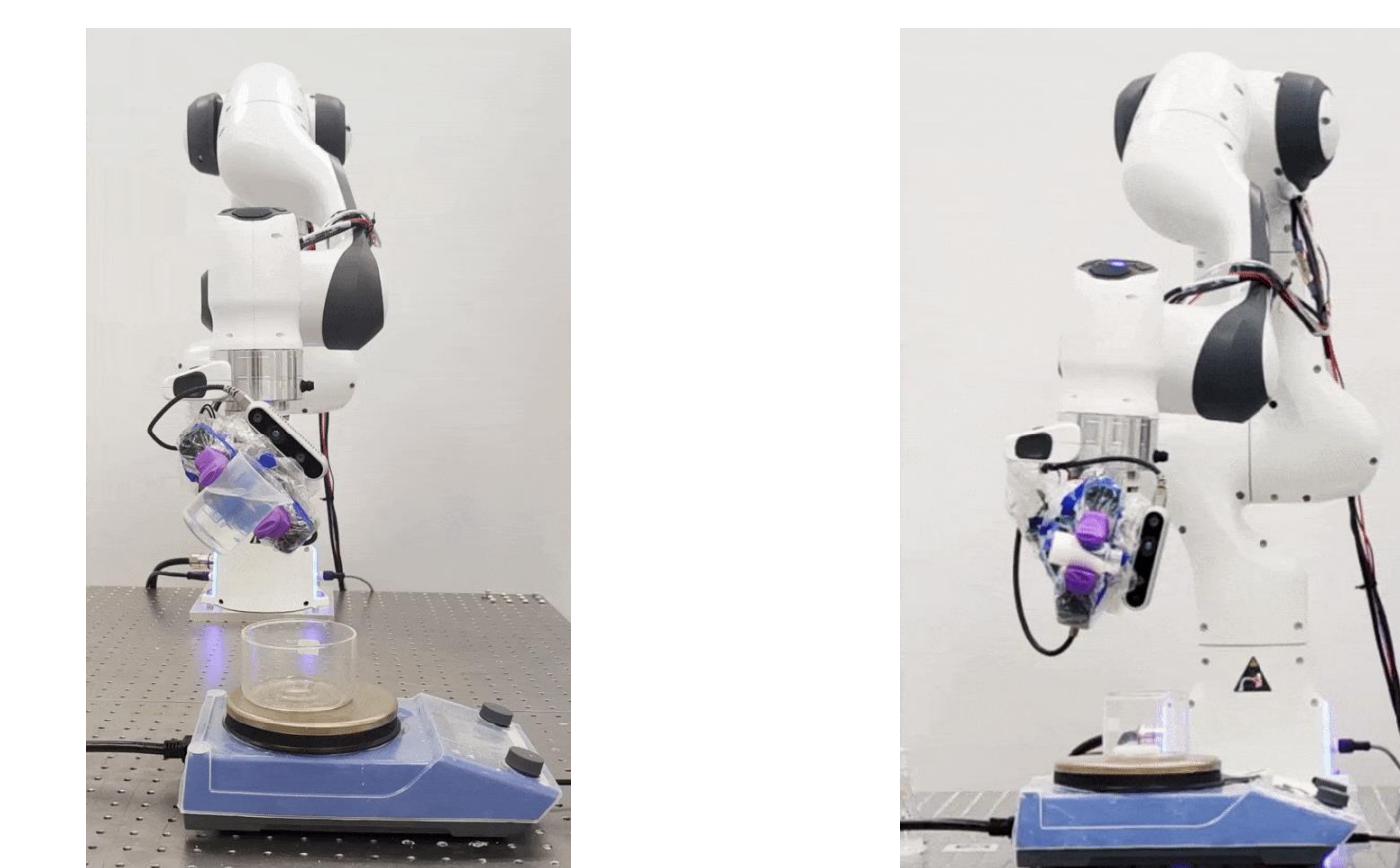
Computer Vision for Solution



Material	Measured Solubility*	Literature Value
Salt	33.2	35.8
Sugar	226.8	203.9
Alum	10.0	11.4

*Solubility per 100 g of water

Pouring Skill



Liquid

Solid

Project Website

<https://ac-rad.github.io/robot-chemist-tamp/>

arXiv

<https://arxiv.org/abs/2212.09672>

