An Evaluation of Particle Filters for Contact-SLAM Problems

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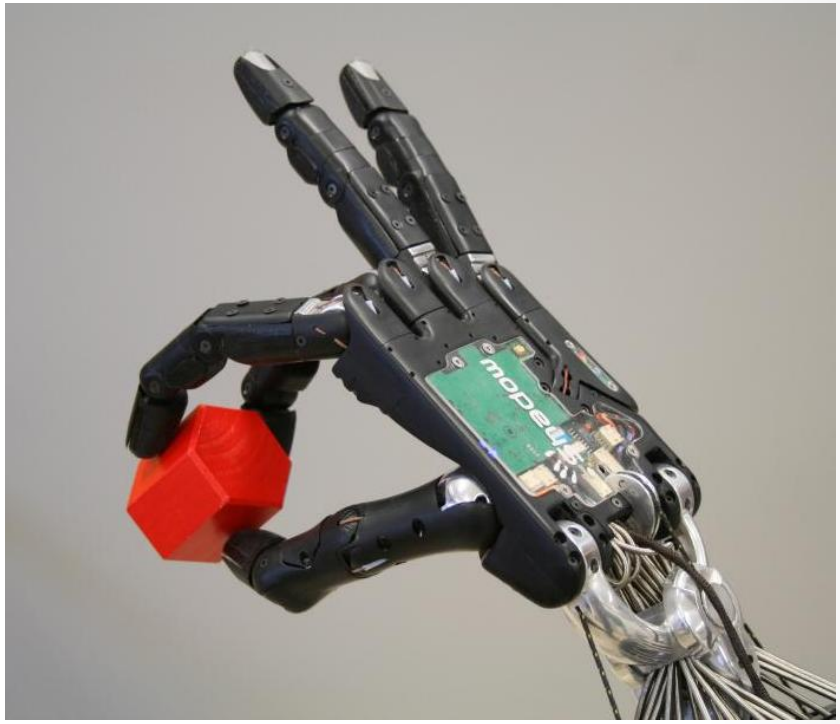
Contact-SLAM Problem

- Design filter to track:
  - Object Pose
  - Contact Locations
  - Physical Parameters, such as coefficient of friction.
- Research goal:
  - To understand the design trade-offs of particle filter.

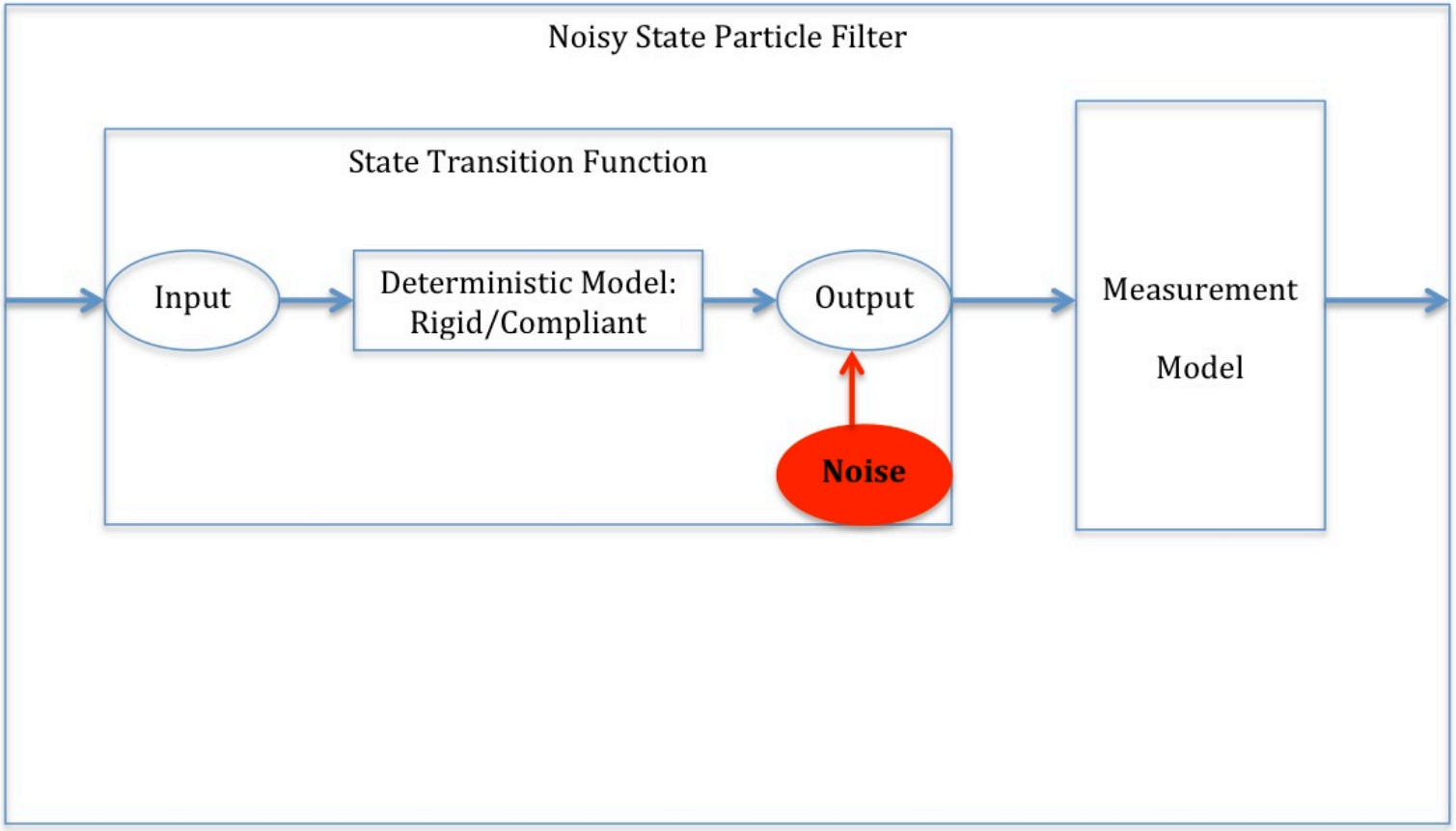


Evaluation of Particle Filters for Contact-SLAM

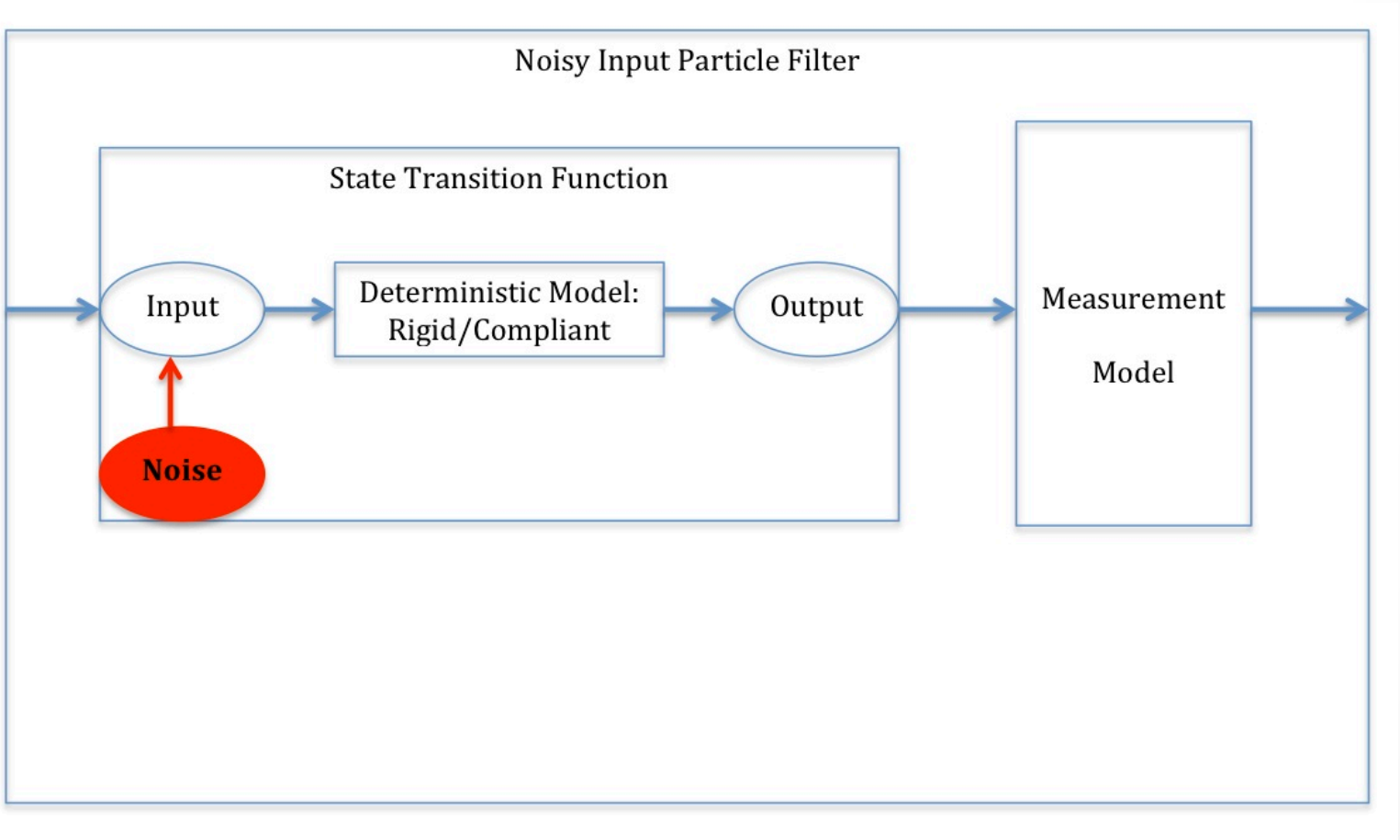
- We studied the case of a robot making contact with an object with its end-effector.

- Four models were studied:
  (a) two contact models: Rigid and Compliant
  (b) two noise models: Noise added to input and output
- Different methods of filtering were tested.

Filtering Methods



Filtering Methods



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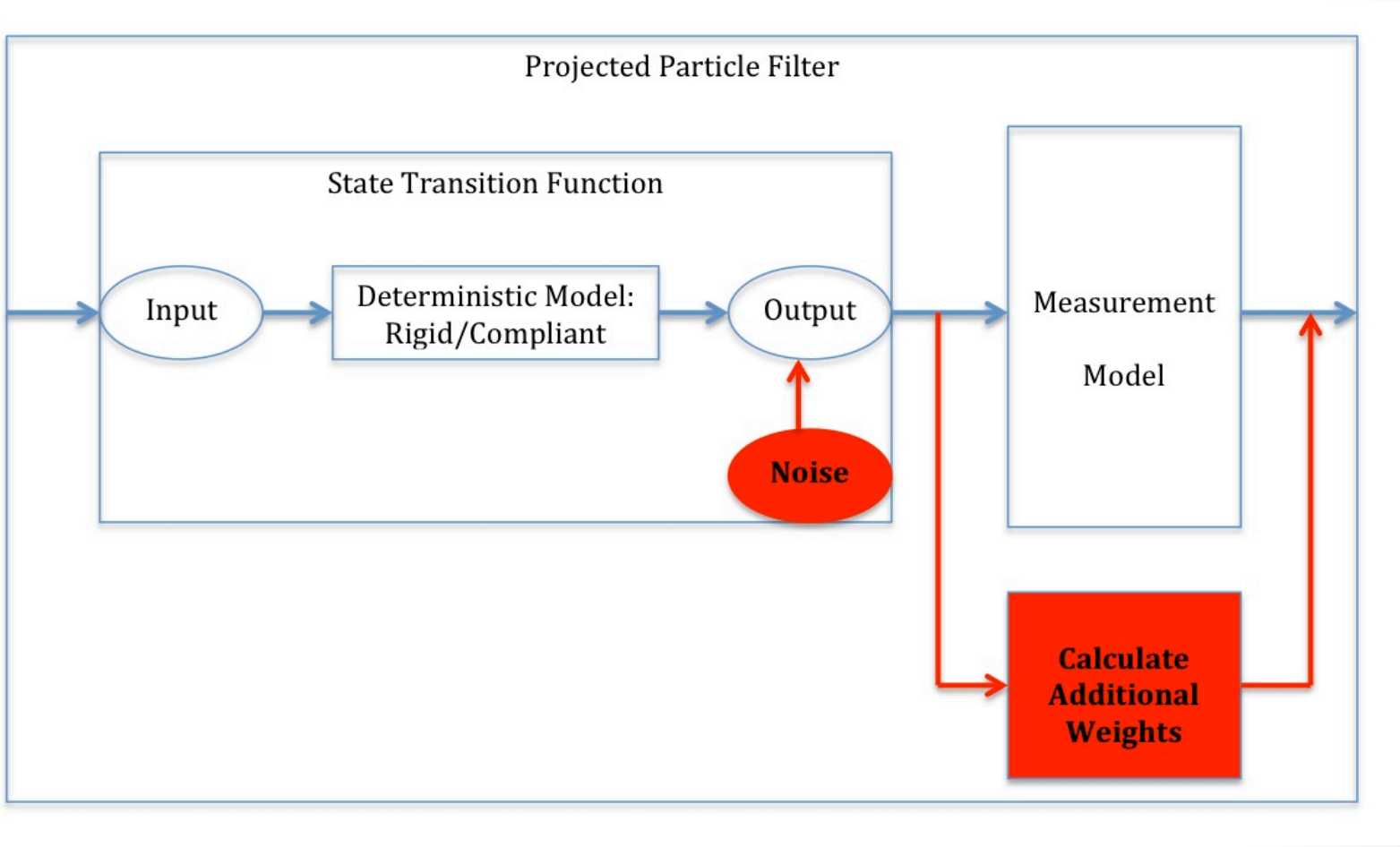

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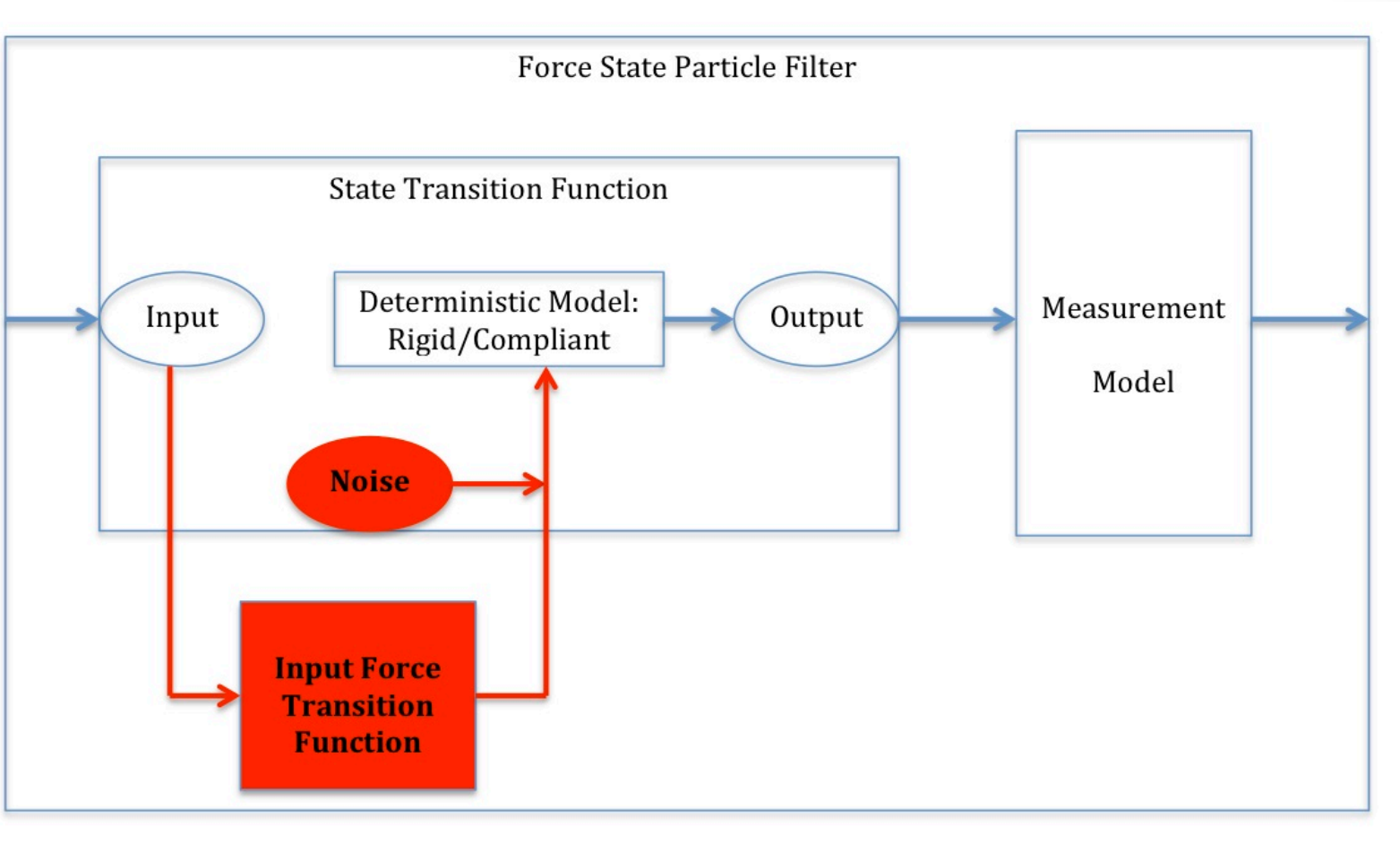

Results

We tested all our methods in both simulation experiments and physical experiments.

Result Conclusions:

- Different noise models with proper choice of noise levels perform similarly on tracking.
- Adding noise to the input performs the best for contact prediction.
- Rigid body and compliant body models show no big differences for contact perdition in physical experiments while compliant body model is a better option for contact prediction in simulation experiments.