

Joint Inference & Belief Space Planning methodology for Efficient Inference Update

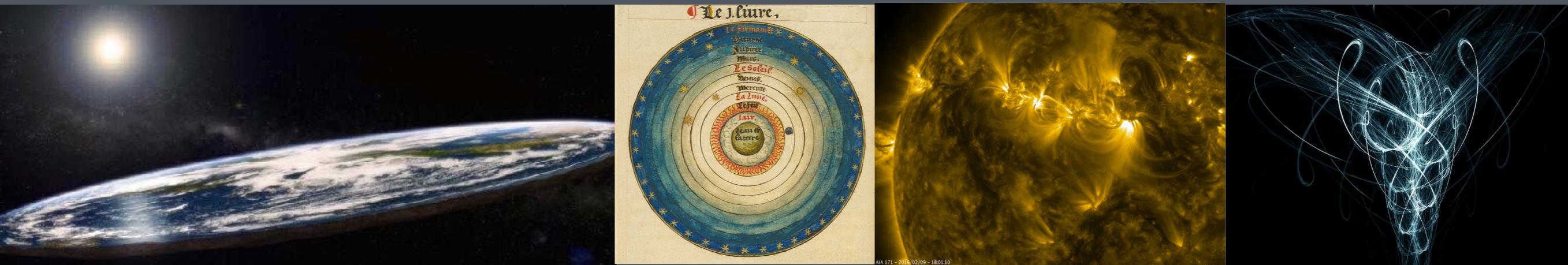


E l a d I . F a r h i & V a d i m I n d e l m a n

May 2017

Theories Proven Wrong...

- Earth is not Flat nor is it a perfect Sphere
- Earth is not in the center of our solar system



- The Sun is not really yellow
- Aether has nothing to do with Light, Gravity Drag or Radio

Paradigm Shift

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Inference and Planning
should not be treated as
separate processes



Our Contribution

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- Inference Update via precursory planning stage
- Presenting JIP - Joint Inference & BSP novel paradigm

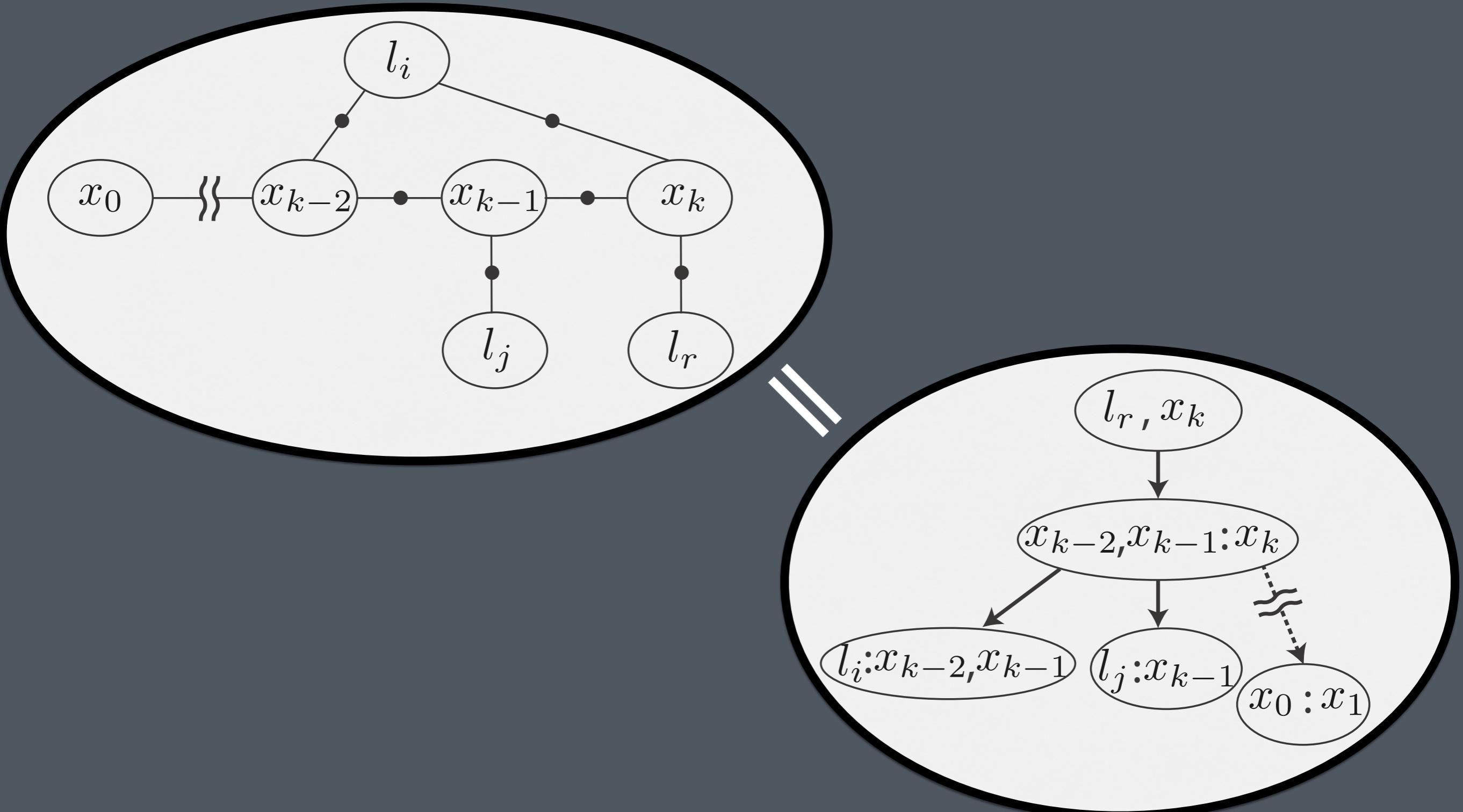
Worth Mentioning

- In this work we assume consistent Data Association
- Our solution provides with the same estimation Accuracy



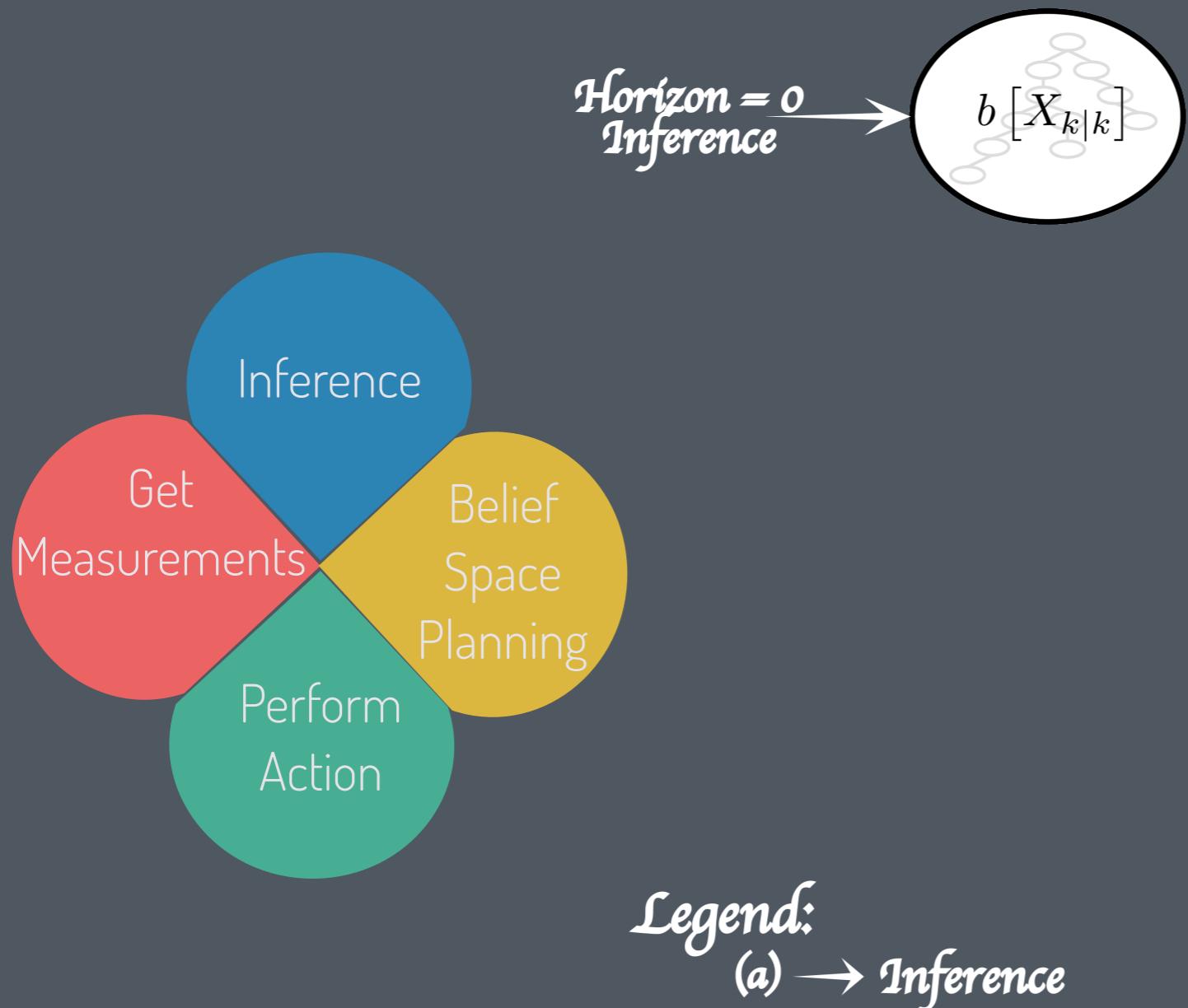
Belief $b[X_{k|k}]$ as a Factor Graph or a Bayes Tree

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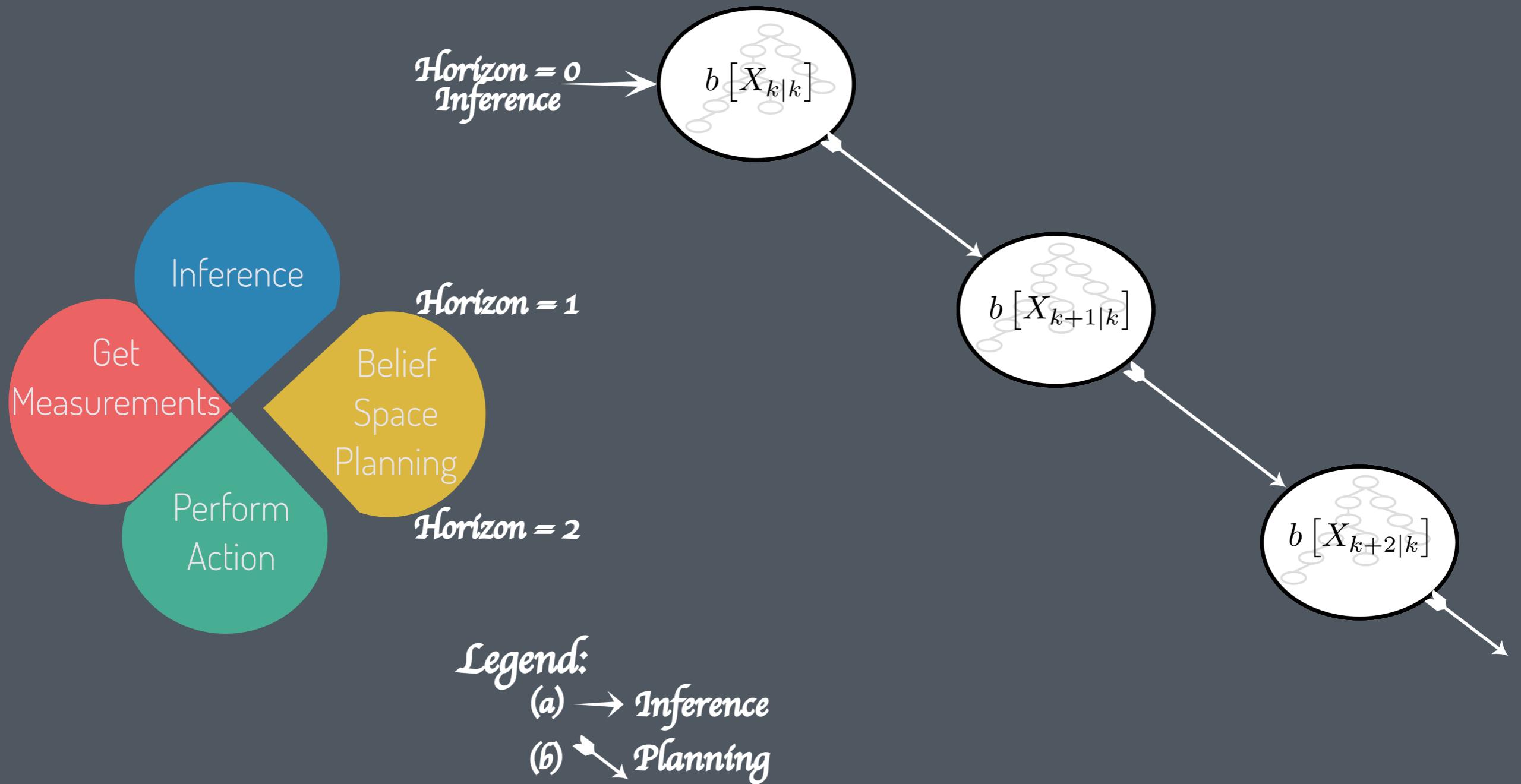


What is Being Done Today

6

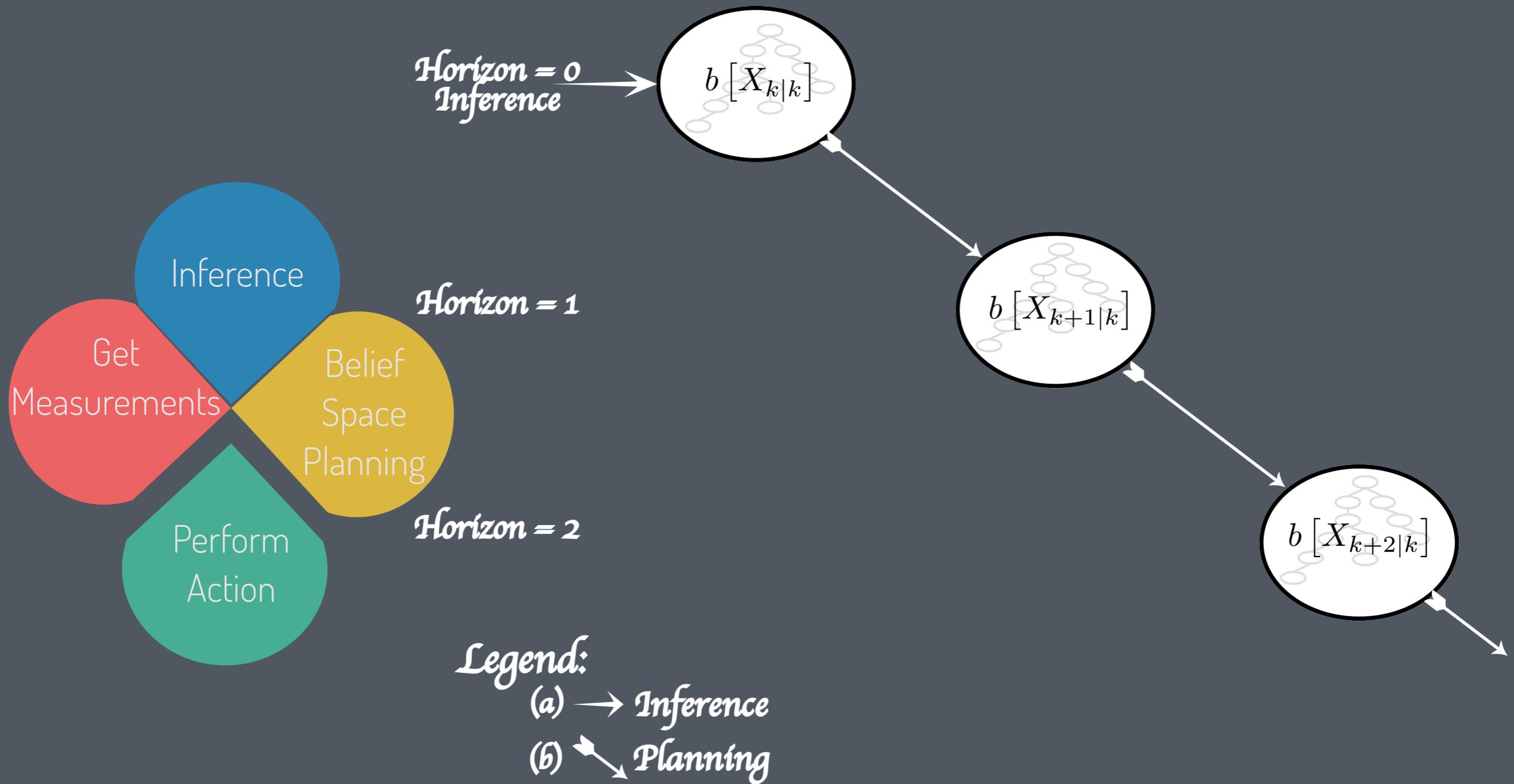


What is Being Done Today



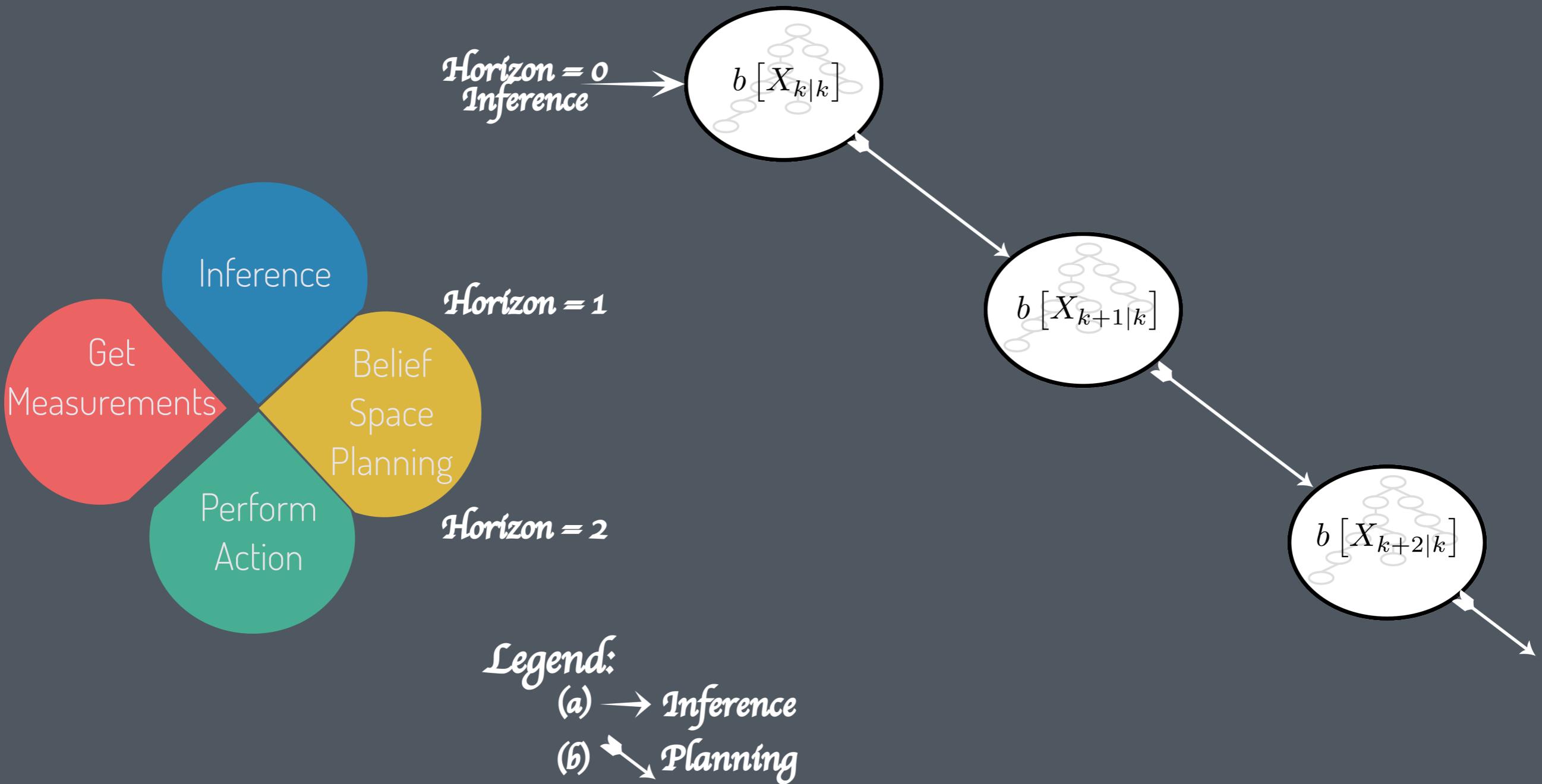
What is Being Done Today

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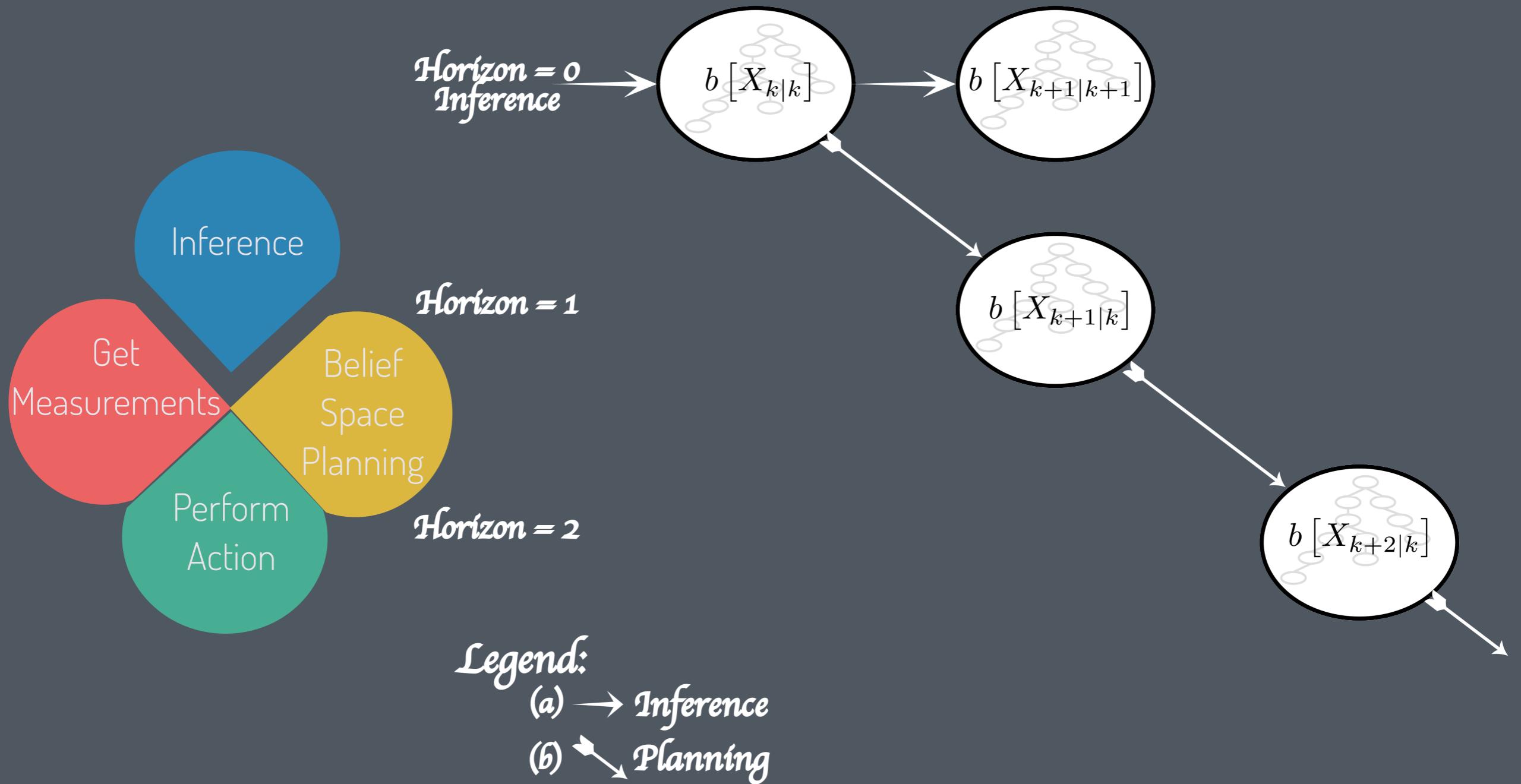


What is Being Done Today

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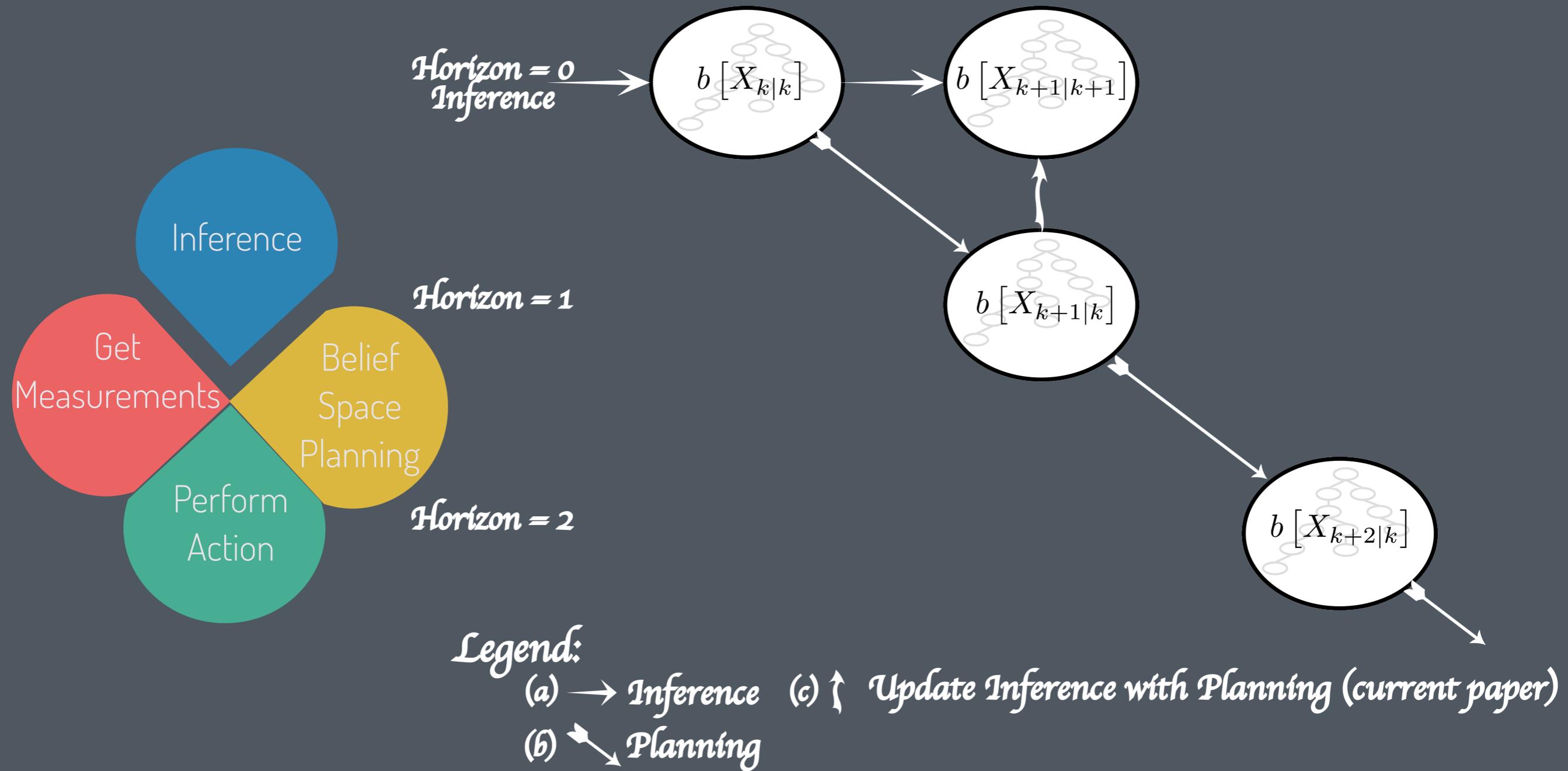


Inference Update Today



Inference Update via Precursory BSP

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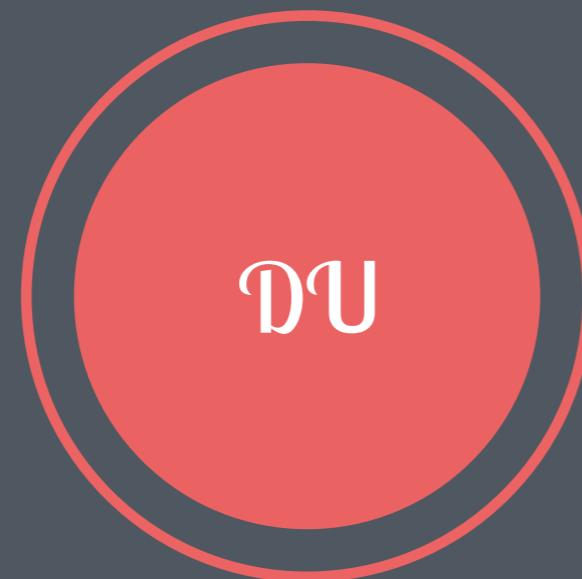


Our proposed methods

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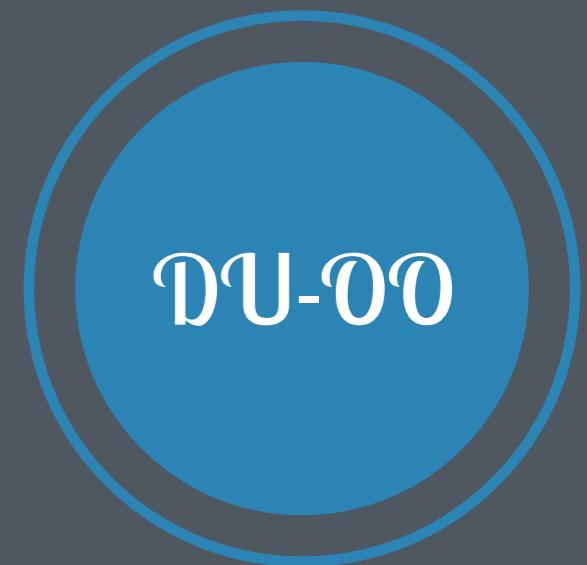
Orthogonal
Transformation
Matrix



Down-date
Update



OTM - Only
Observations



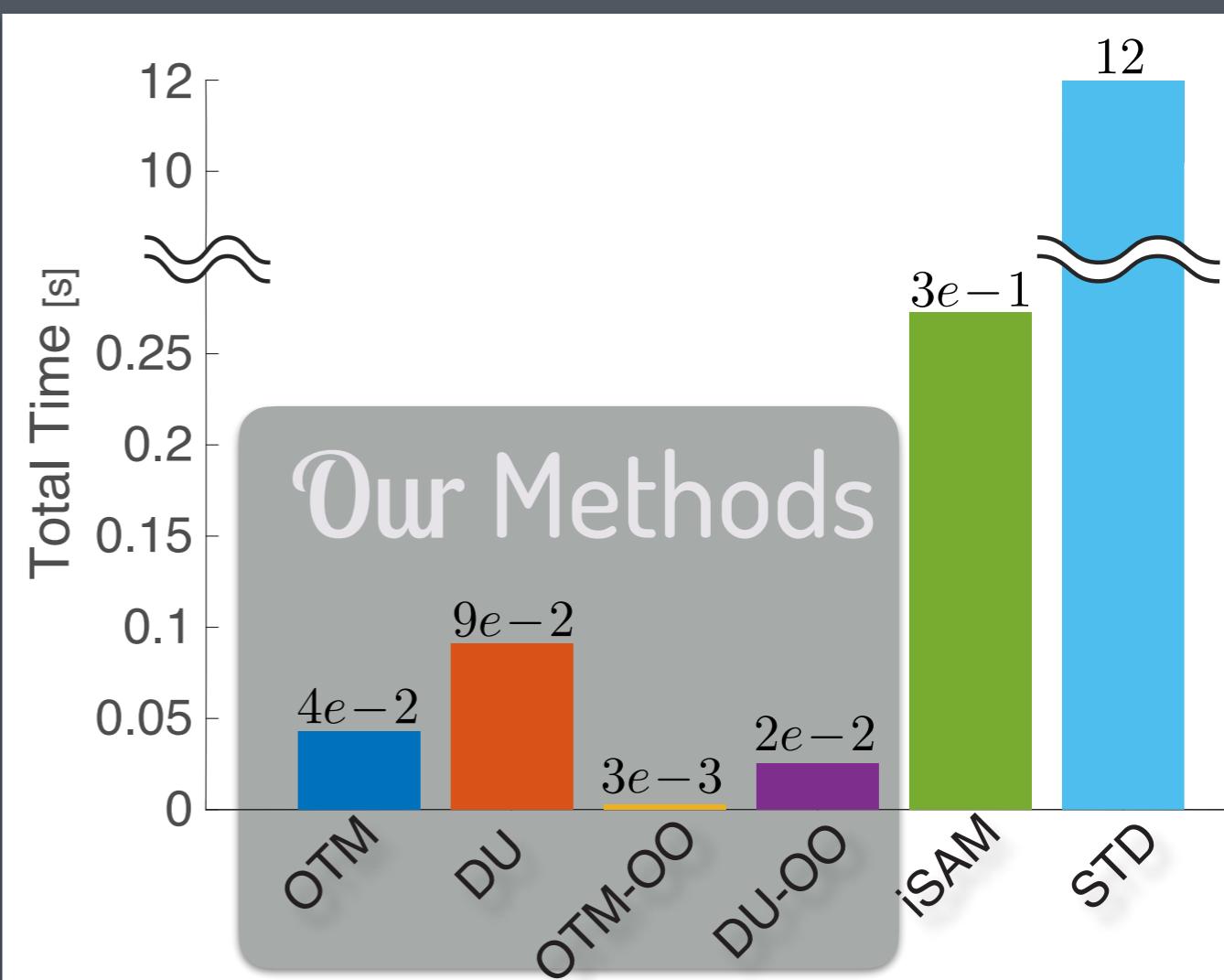
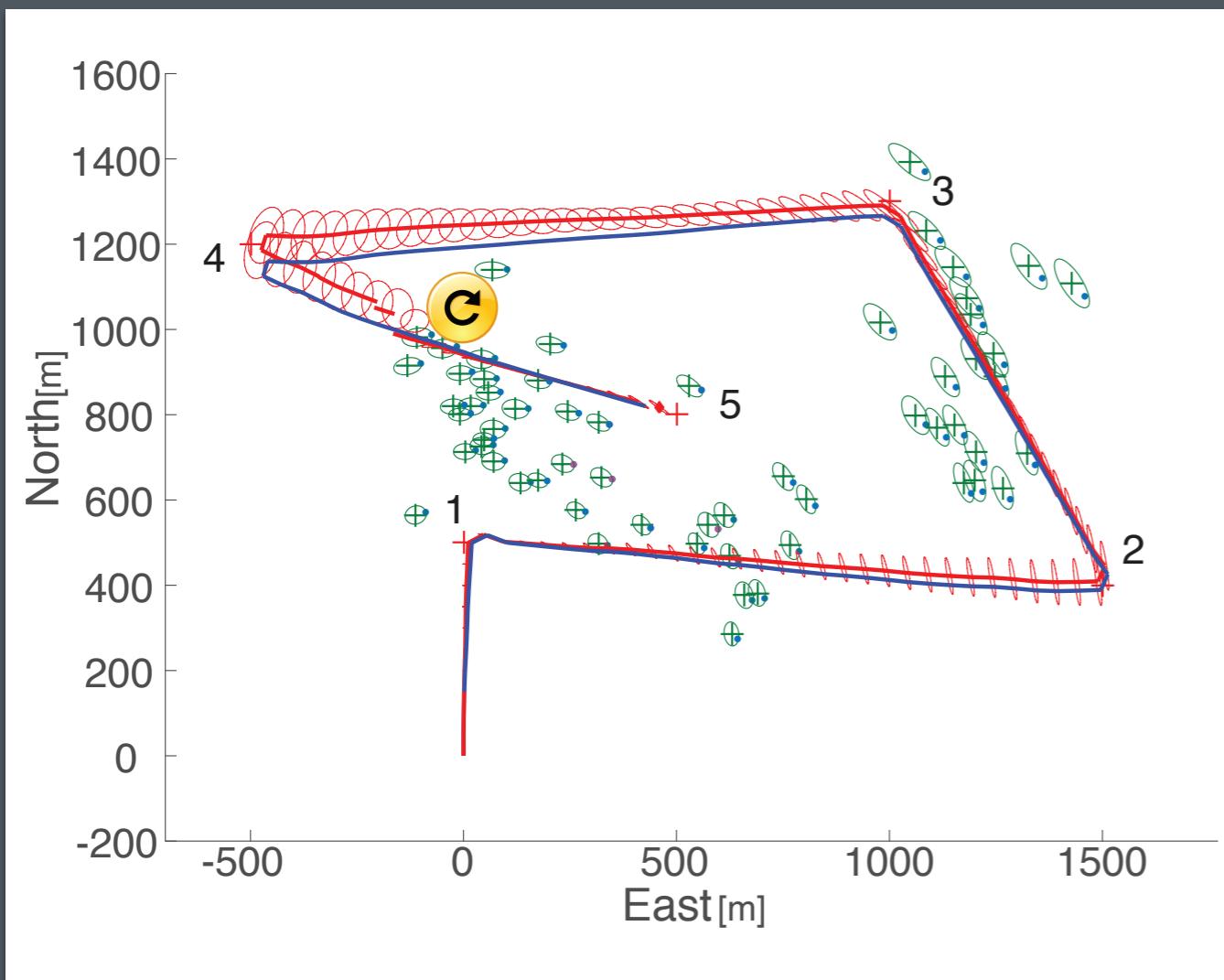
DU - Only
Observations



TASP | TECHNION AUTONOMOUS
SYSTEMS PROGRAM

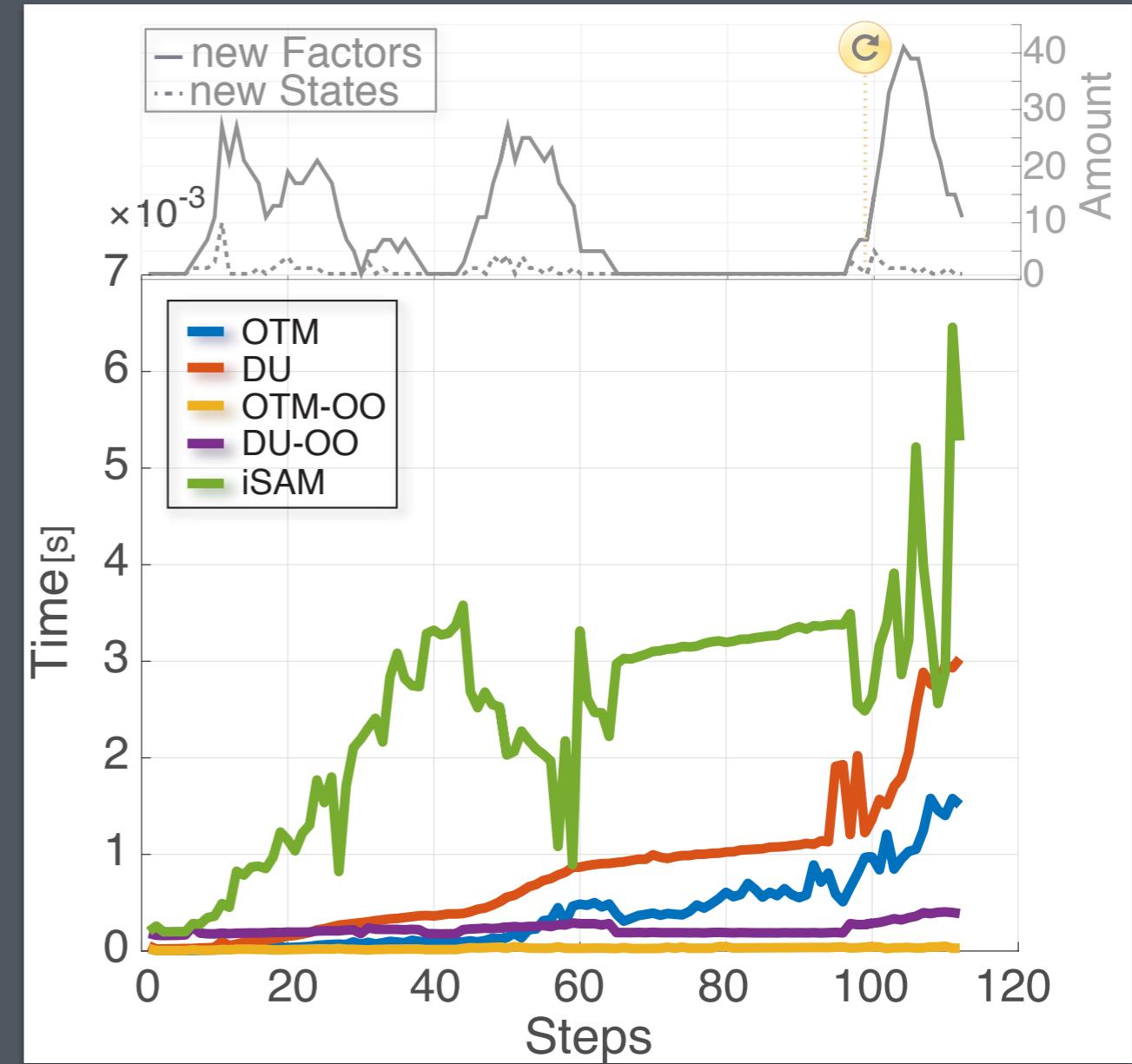
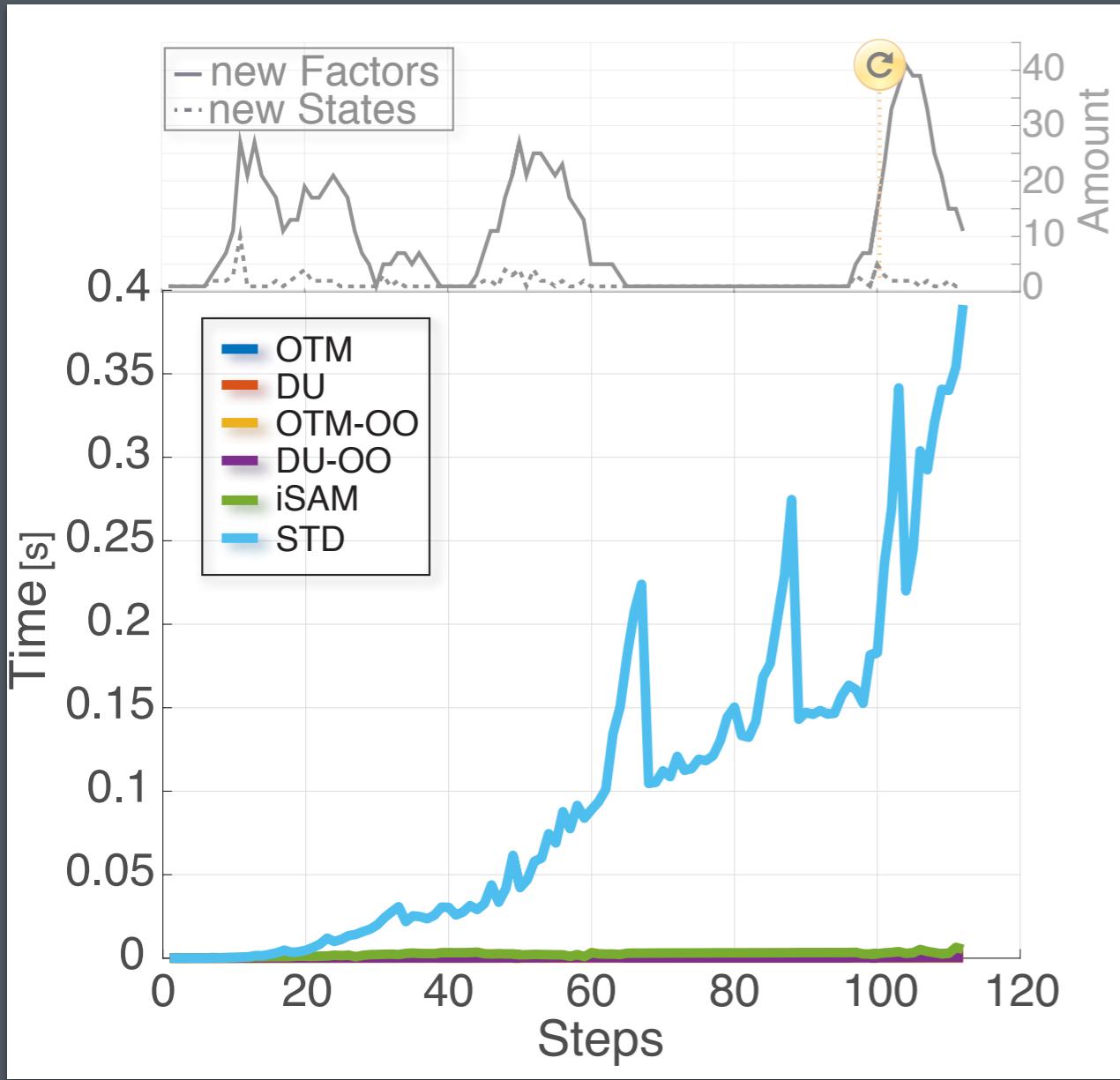
Inference Update - Total Time Comparison

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Performance Per-step

14



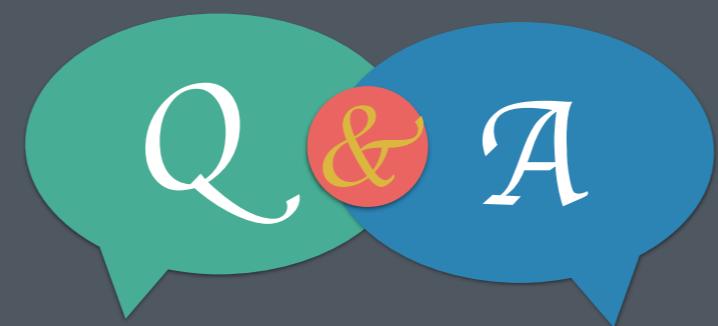
Summing Up

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- Paradigm Shift - Efficient inference update is viable using calculations from precursory planning
- We provided four different methods that efficiently update inference under consistent DA assumption.
- Our methods, in particular **OTM-OO**, are faster by orders of magnitude and more robust to state dimensionality and loop closures
- We presented **JIP** novel approach for joint inference and belief space planning paradigm



Q & A Session



*Thanks for Listening
Looking forward to answer your questions*

@ Station #1

