Collaborative Research: NRI: INT: Scalable, Customizable, Robot Learning with Humans

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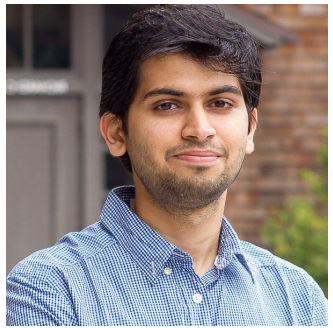

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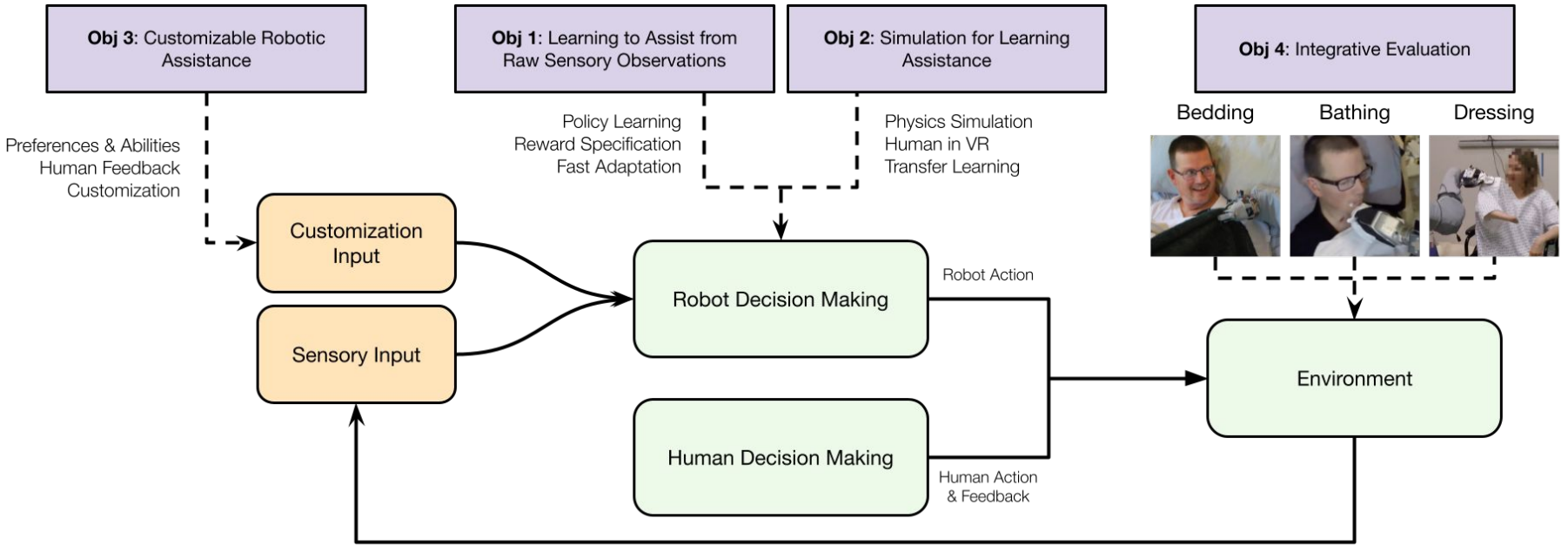
A. Kapusta, Z. Erickson, H. M. Clever, W. Yu, C. K. Liu, G. Turk, C. C. Kemp, “Personalized Collaborative Plans for Robot-Assisted Dressing via Optimization and Simulation,” Autonomous Robots, 2019.

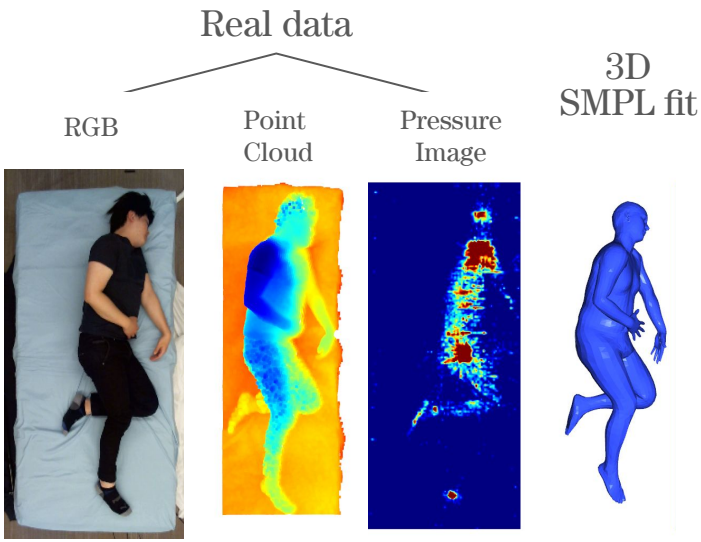
A. Kapusta, P. M. Grice, H. M. Clever, Y. Chitalia, D. Park, and C. C. Kemp, “A system for bedside assistance that integrates a robotic bed and a mobile manipulator,” PloS one, 2019.

Approach


Obj 3: Customizable Robotic Assistance
Obj 1: Learning to Assist from Raw Sensory Observations
Obj 2: Simulation for Learning Assistance
Obj 4: Integrative Evaluation
Preferences & Abilities
Human Feedback
Customization
Policy Learning
Reward Specification
Fast Adaptation
Physics Simulation
Human in VR
Transfer Learning
Bedding
Bathing
Dressing
Customization Input
Sensory Input
Robot Decision Making
Robot Action
Human Decision Making
Human Action & Feedback
Environment

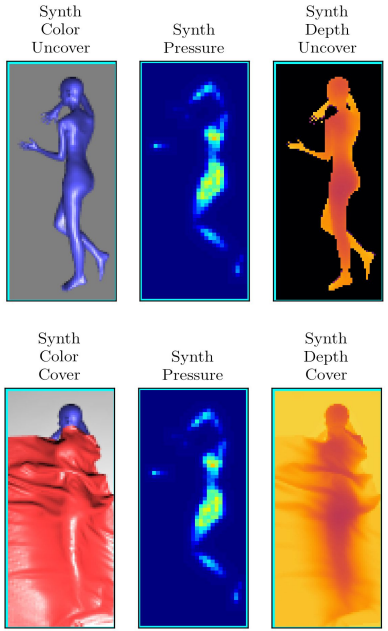
Obj 1: Learning to Assist from Raw Sensory Observations

1. Fit SMPL bodies to point clouds with optimization



Real data: SLP dataset from Prof. Sarah Ostadabbas's lab.

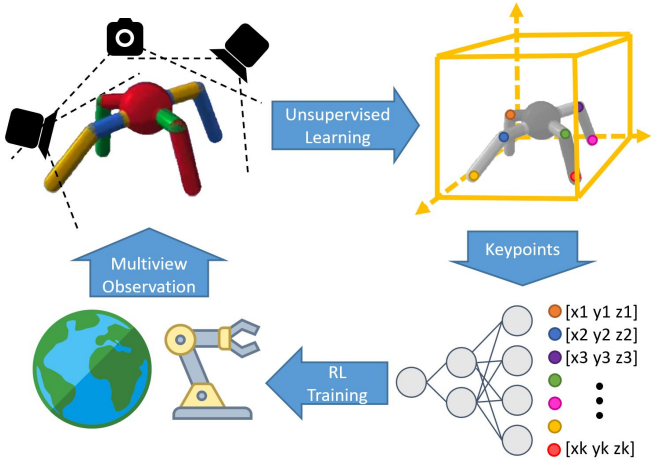
2. Generate large synthetic dataset using SMPL fits with physics simulations



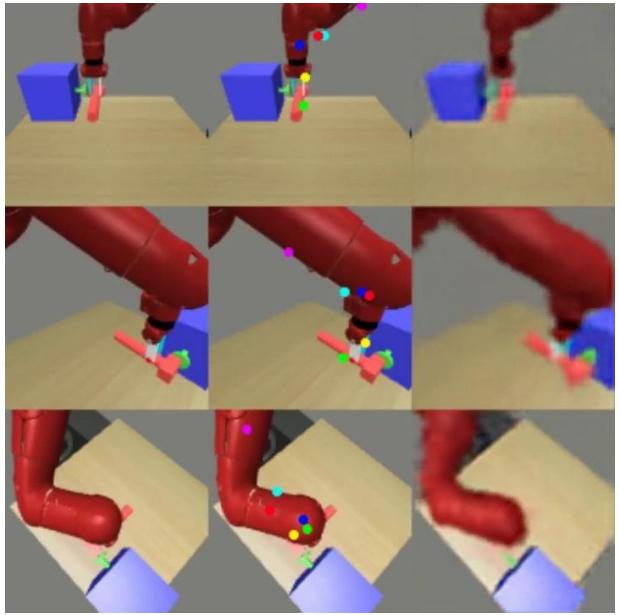
3. Employ synthetically trained model to inform real robotic assistance

illustration of future work

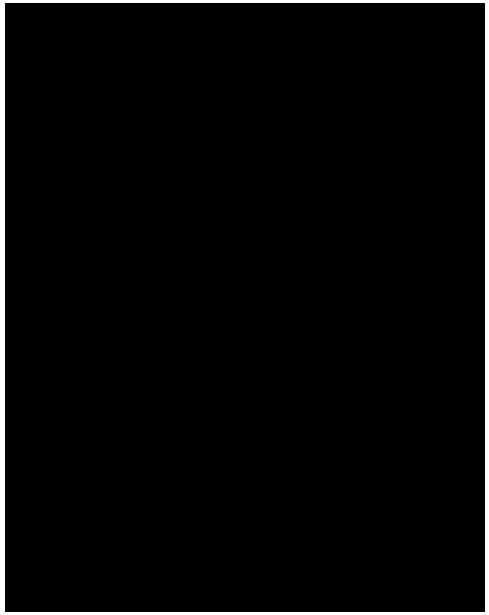
Obj 1: Learning to Assist from Raw Sensory Observations



Unsupervised Learning of Visual 3D Keypoints for Sensorimotor Control



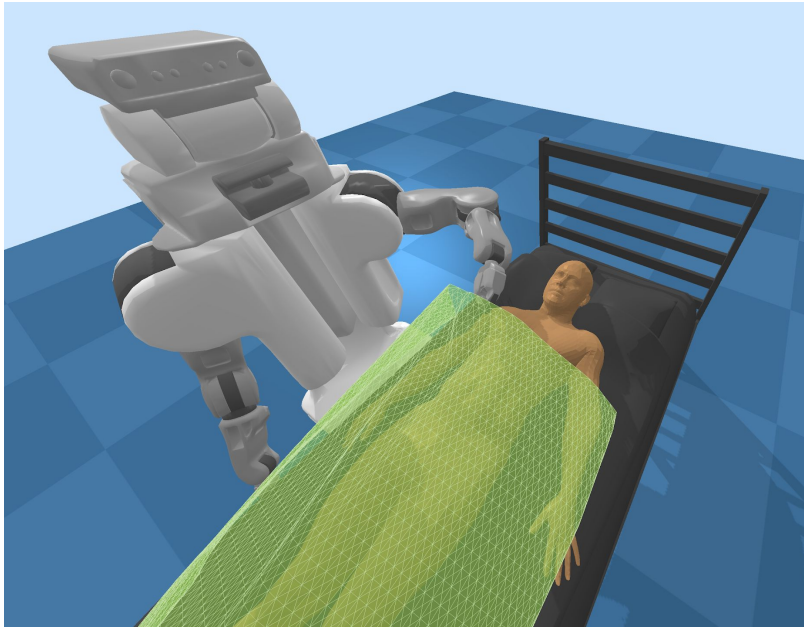
Rigid Body Manipulation using Learned Visual 3D Keypoints



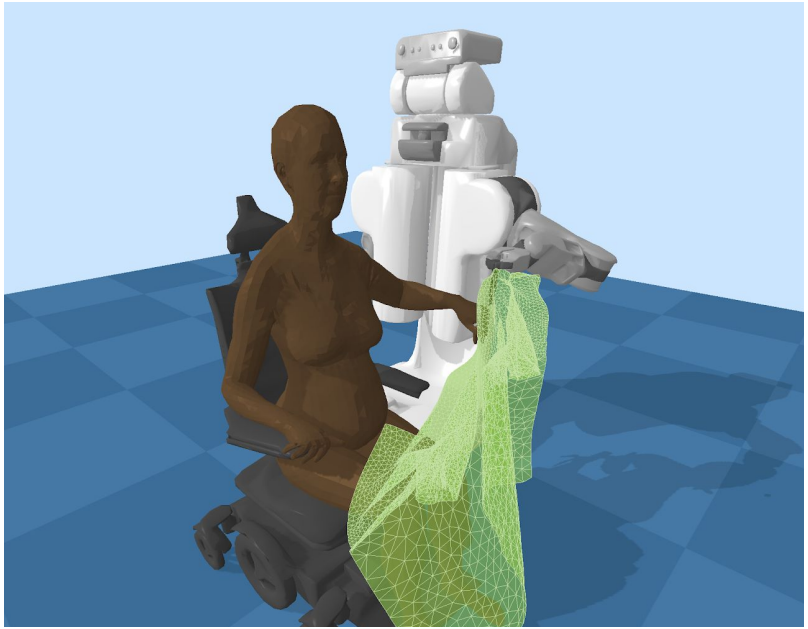
Deformable Manipulation using Learned Visual 3D Keypoints

Obj 2: Simulation for Learning Assistance

Assistive Gym - physics simulation framework



Bedding Manipulation



Dressing Assistance

Thank you

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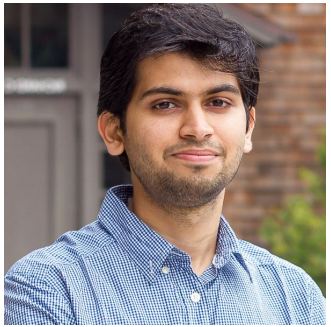

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