NRI: EAGER: Teaching Aerial Robots to Perch Like a Bat via AI-guided Design and Control

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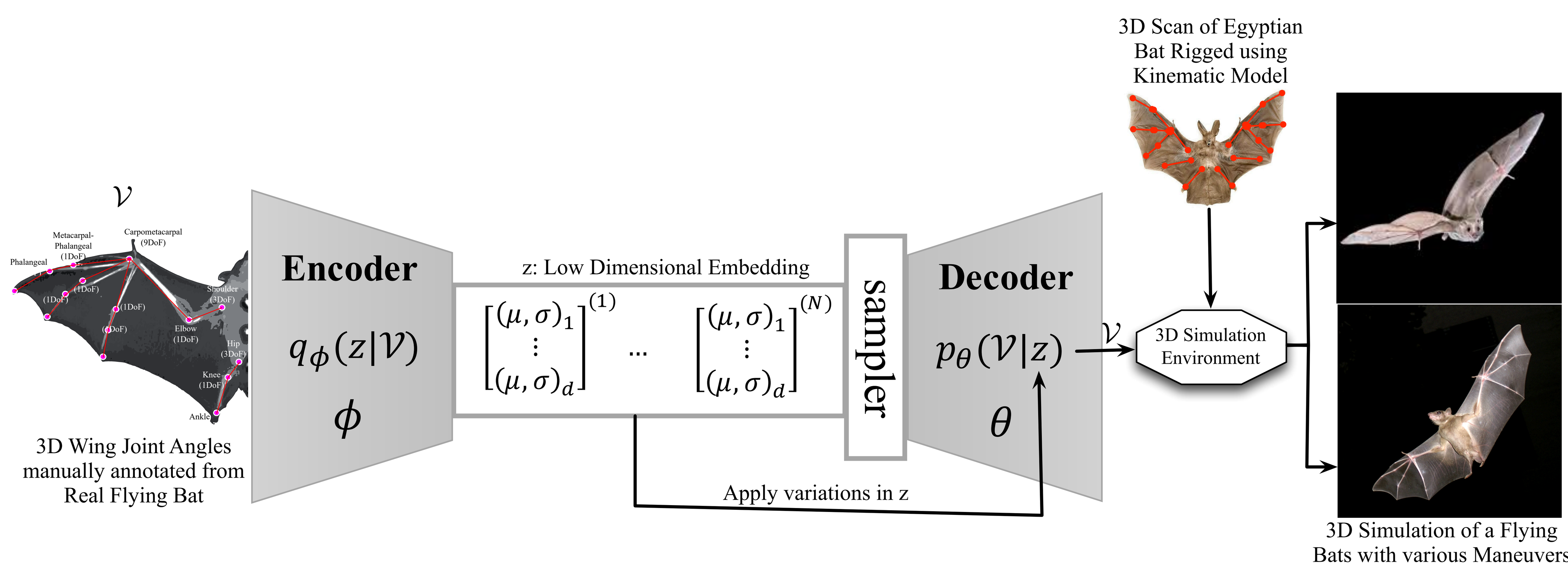
https://web.northeastern.edu/ostadabbas/2019/09/11/ostadabbas-as-pi-awarded-an-nsf-nri-eager/



Bat as An Inspiration for Aerial Robots Design

In contrast with other animals that have developed complex multi degrees of freedom (DoF) legged, aerial or aquatic locomotion feats, bats have an extremely articulated musculoskeletal system that is interlocked with their neural network and brain to execute core communication and decision making tasks and deliver an impressively adaptive and multimodal locomotion behavior.

Our Vision

The various aspects of bat flight bring a unique perspective into the research in novel aerial, soft bio-inspired designs that are safe to operate at the proximity of humans, extremely agile, collision-tolerant with impressive mobility that can reach to hard-to-access locations in the complex physical world and congregate for monitoring, surveillance, energy harvesting, etc.

Our Solution

In this research, we will adopt an AI-guided framework to study bat's various flight maneuvers including perching (i.e. upside-down landing), zero-path flight, and hovering. Our AI-guided research into copying bat flight in the context of robotics-inspired biology will provide enormous insight into understanding fundamentals regarding the design of soft co-robots. ***Our research objective will simplify the engineering procedure to design bio-inspired aerial co-robots that closely mimic the flight behavior of a target animal, therefore is directly towards lowering the barriers for understanding fundamentals regarding closed-loop control and design of bio-inspired multimodal co-robots.***

Soft small unmanned aerial system that can provide computing, communication and sensing capabilities in large-scale systems such as residential buildings, streets, construction zones, state parks, etc, across both space and time.

The project will create programs and tools to train workforce (PhD student and Postdoc) with new skills including bio-inspired robotics, machine learning and artificial intelligence, and nonlinear control theory.

The resulting technology will significantly improve public safety and vehicular dynamic traffic control in smart cities and cost-effectiveness associated with monitoring environmental disasters.

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