BASIN HOPPING MONTE CARLO TRACKER FOR NON-RIGID OBJECTS

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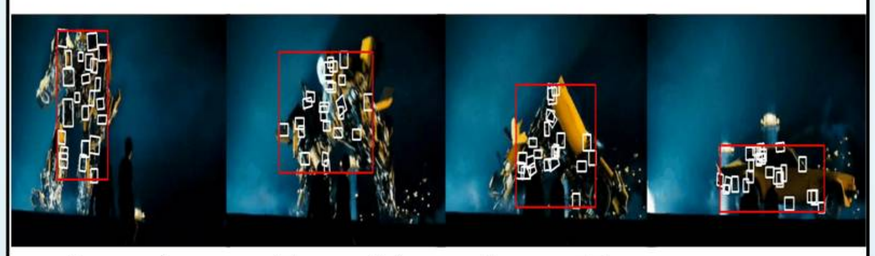
ABSTRACT

We propose a novel tracking algorithm for the target of which geometric appearance changes drastically over time. To track it, we present a local patch-based appearance model and provide an efficient scheme to evolve the topology between local patches by on-line update. In the process of on-line update, the patch can be moved, deleted or newly added. Additionally, we introduce the Basin Hopping Monte Carlo sampling method to our tracking problem to reduce the computational complexity and deal with the problem of getting trapped in local minima.

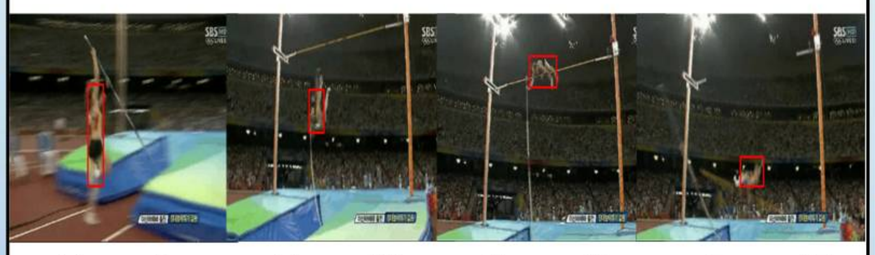
EXPERIMENTS



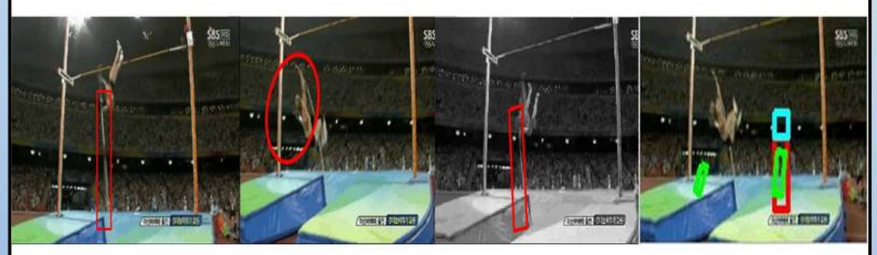
Frame 6 Frame 54 Frame 77 Frame 123

Frame 1 Frame 117 Frame 125 Frame 212

MCMC Mean Shift Ross et al. Particle Filter



Frame 1 Frame 21 Frame 41 Frame 67



MCMC Mean Shift Ross et al. Ramanan et al.

Conclusion

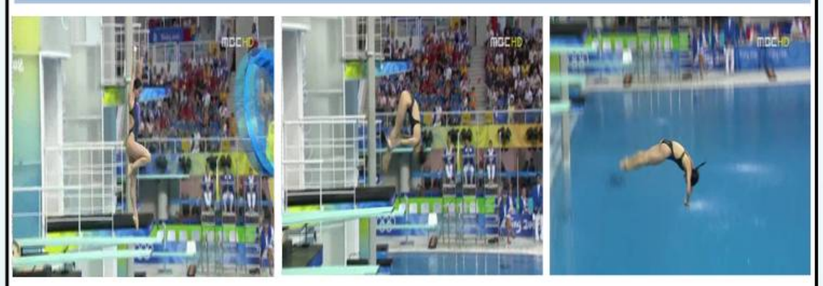
Our approach tracks the object whose geometric appearance is drastically changing, accurately and robustly.

- By **Patch-based dynamic appearance modeling**
- By **Basin Hopping Monte Carlo Sampling**

MOTIVATION

Difficult tracking problem

Real world scenes such as sports or movies



Severe geometric appearance (topology) changes of an object over time.

Problem statement

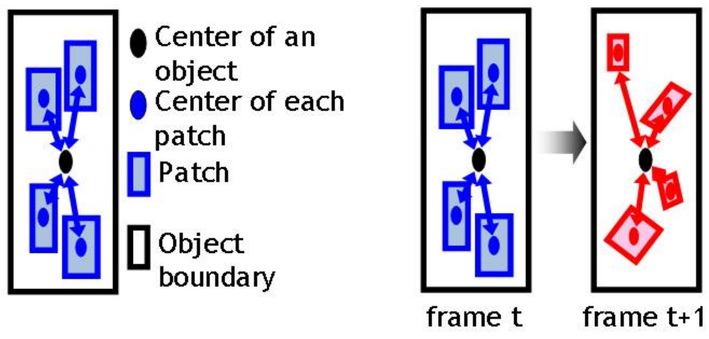
How can we track the target of which **the geometric appearance changes drastically over time** ?

MAIN IDEA

Patch-based appearance modeling

To adapt to the geometric appearance changes

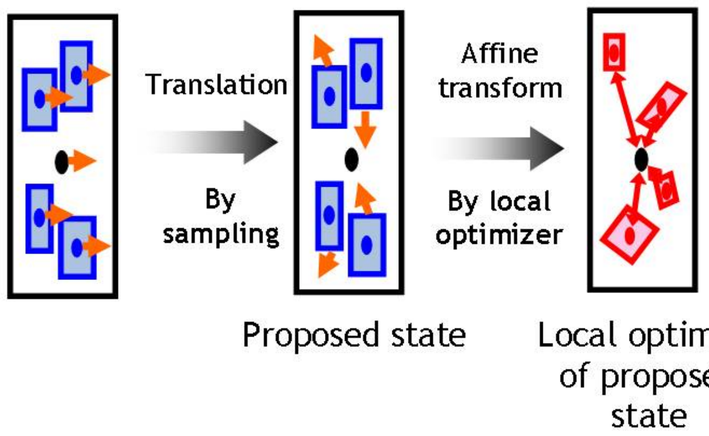
- Representing the appearance of an object **as an assembly of local patches**.
- Evolving the **geometric appearance model** via on-line update.



Basin Hopping Monte Carlo sampling

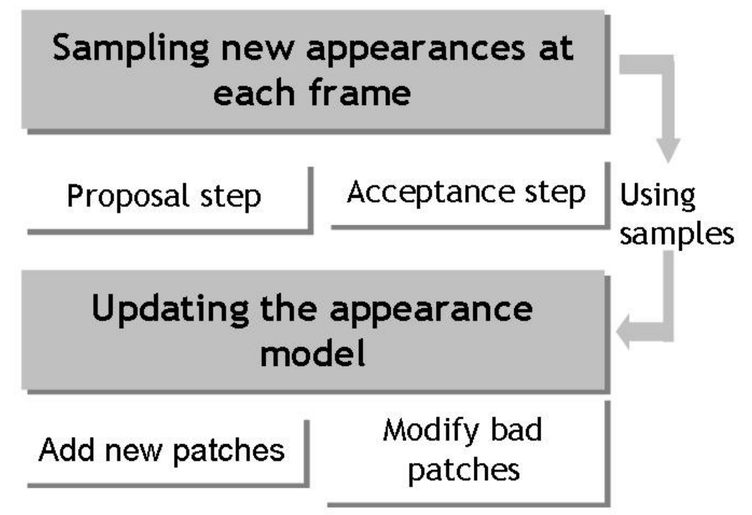
To get new samples easily,

- Combining **Sampling** and **Local Optimizer**.

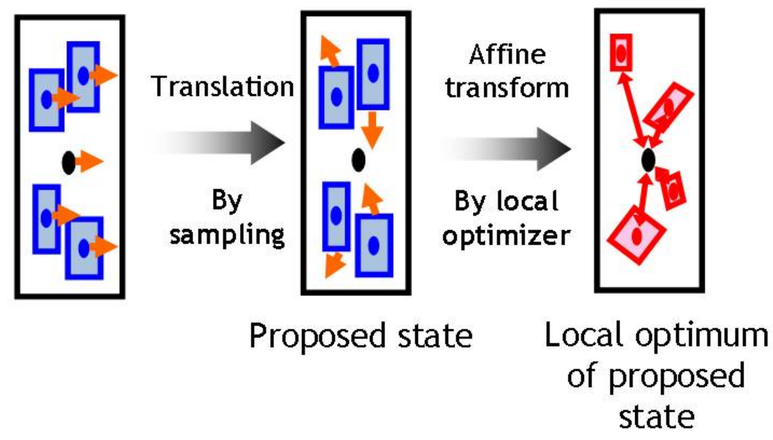


PROPOSED METHOD

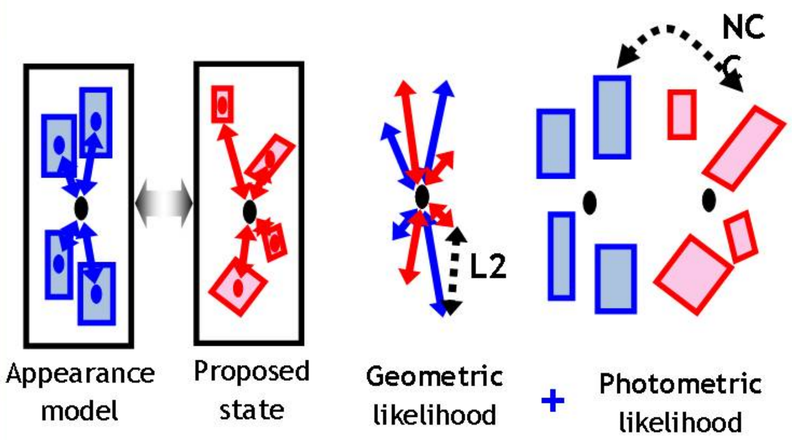
Overview of our algorithm



Proposal step



Calculating likelihood



Acceptance step

$$\left[1, \frac{\text{likelihood at the local optimum of next state}}{\text{likelihood at the local optimum of current state}}\right]$$