Spatial Reasoning and Motion Graphs

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Motivation

- Two common problems
  - Spatial Reasoning
    - "Secure a Landing Zone"

      Identify a landing zone

      Identify the avenues of approach

      Position troops to block avenues of approach
  - Realistic human figure animation
    - "Secure a Landing Zone"

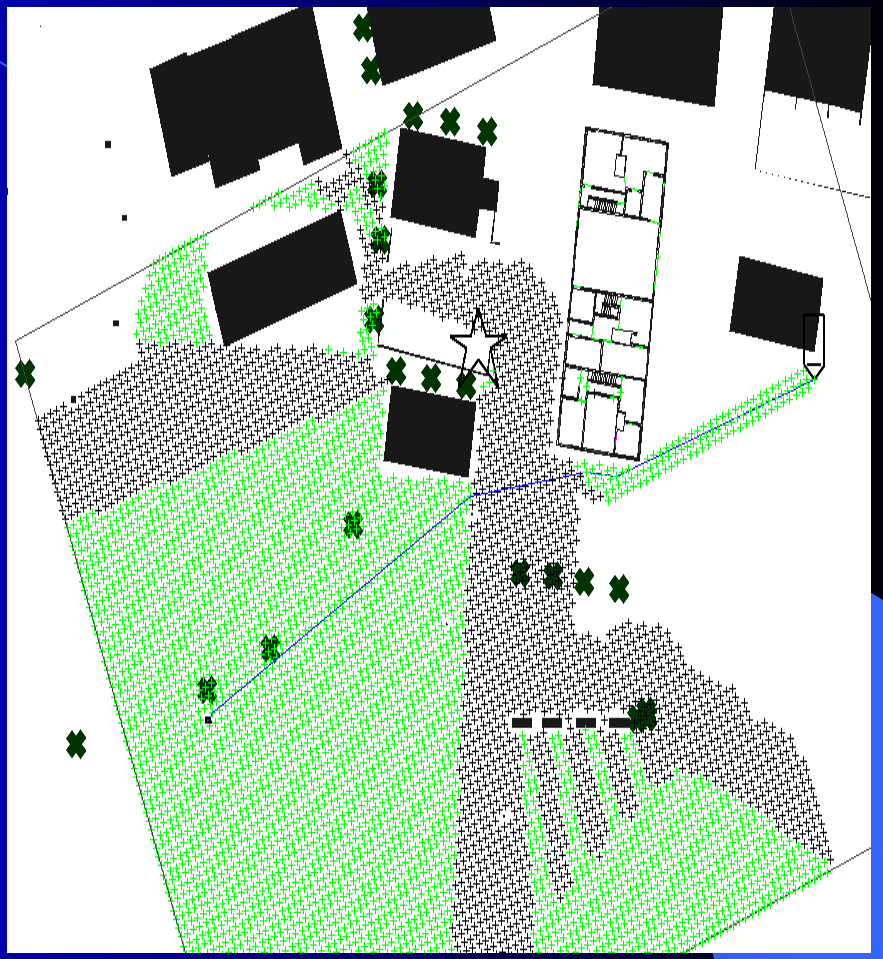
      Explore to find a landing zone

      Avoid windows, doorways…

      Position yourself to protect an avenue of approach
- Related: Need to understand the space to move in it

Related Work

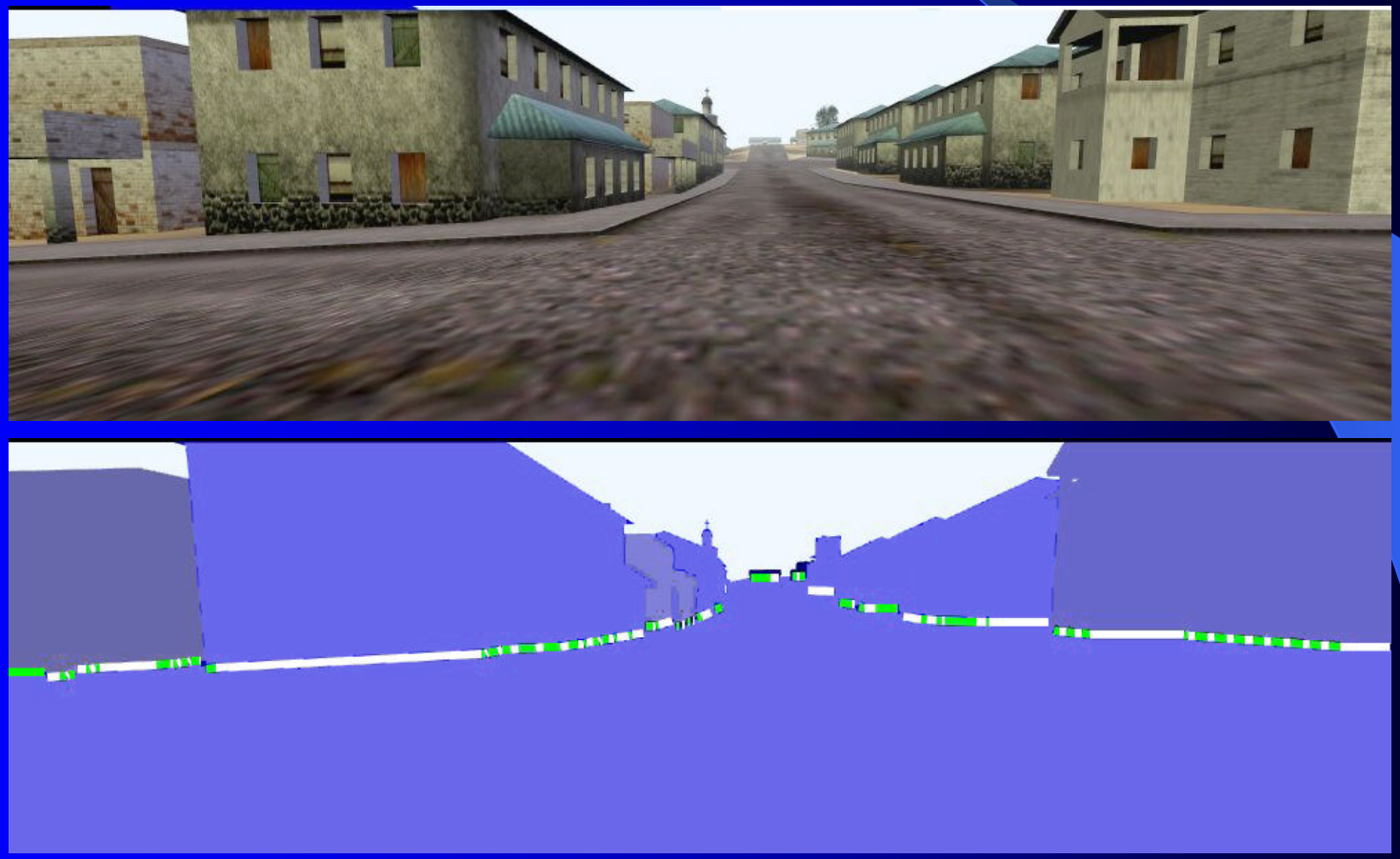
- Path planning :
  - One-time path by path-planning basis techniques (e.g., cell decomposition, weighted region, skeleton)
- Motion capture/generation
  - Little Incremental movement research
  - Little control of movement ‘style’ alongside incremental movement
- Spatial representation
  - Absolute Space Representations (ASR)



- Objective
  - Reactive incremental movement planning by motion graph and cognitive map

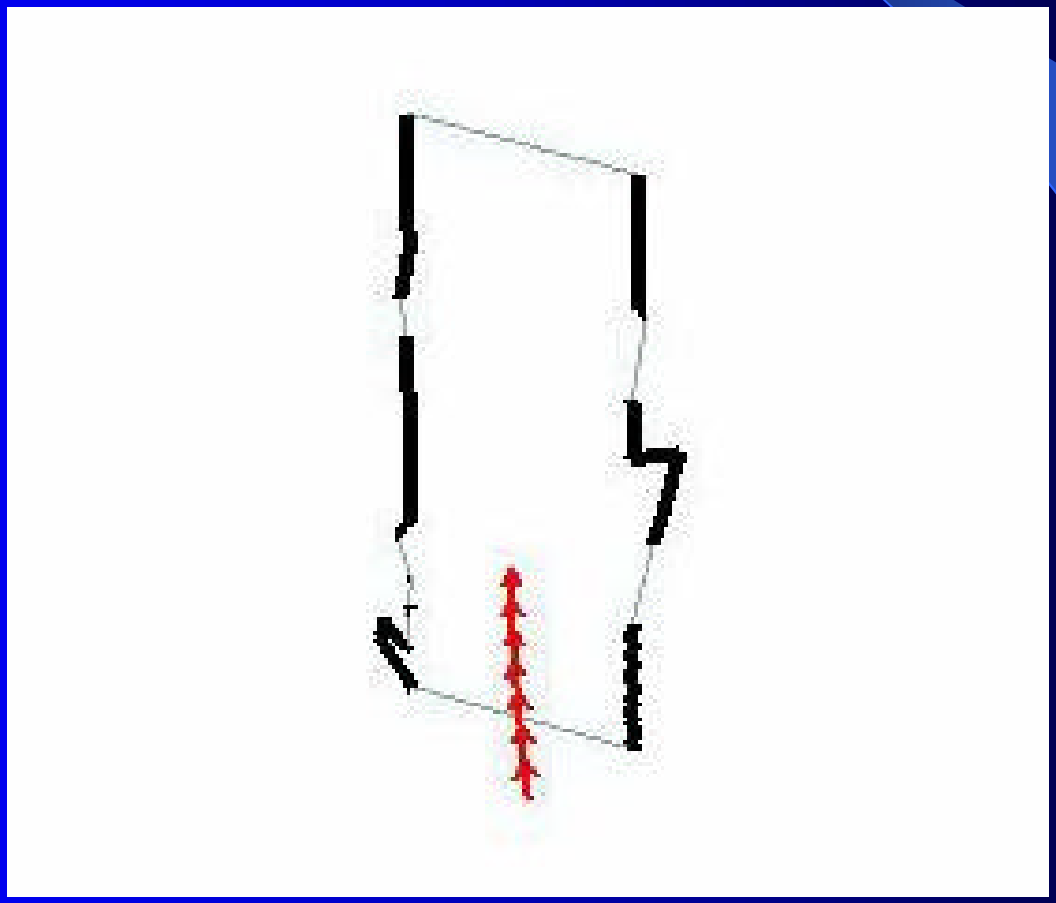
Spatial Mapping (Changhee Han)

- Use edge detection to generate a 2 ½ D map



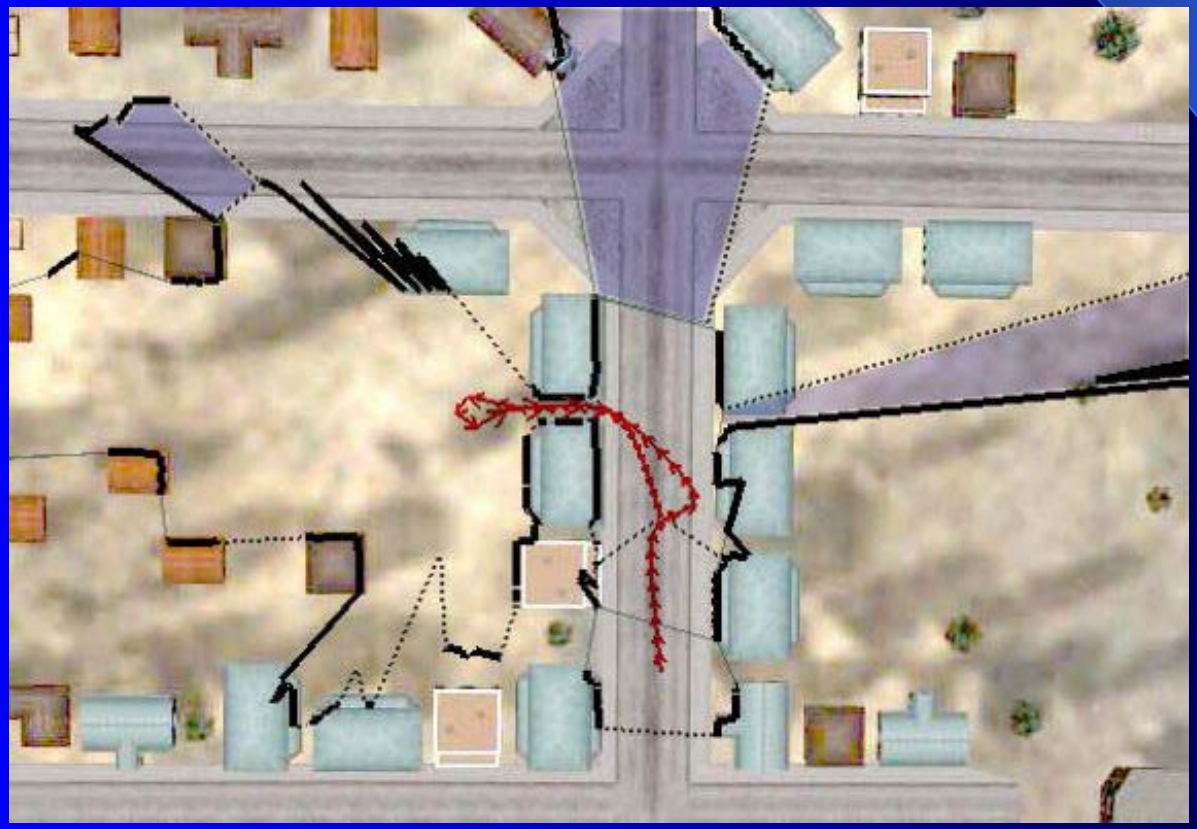
Spatial Mapping (Changhee Han)

- Use edge detection to generate a 2 ½ D map
- Use 2 ½ D map to generate local ASRs



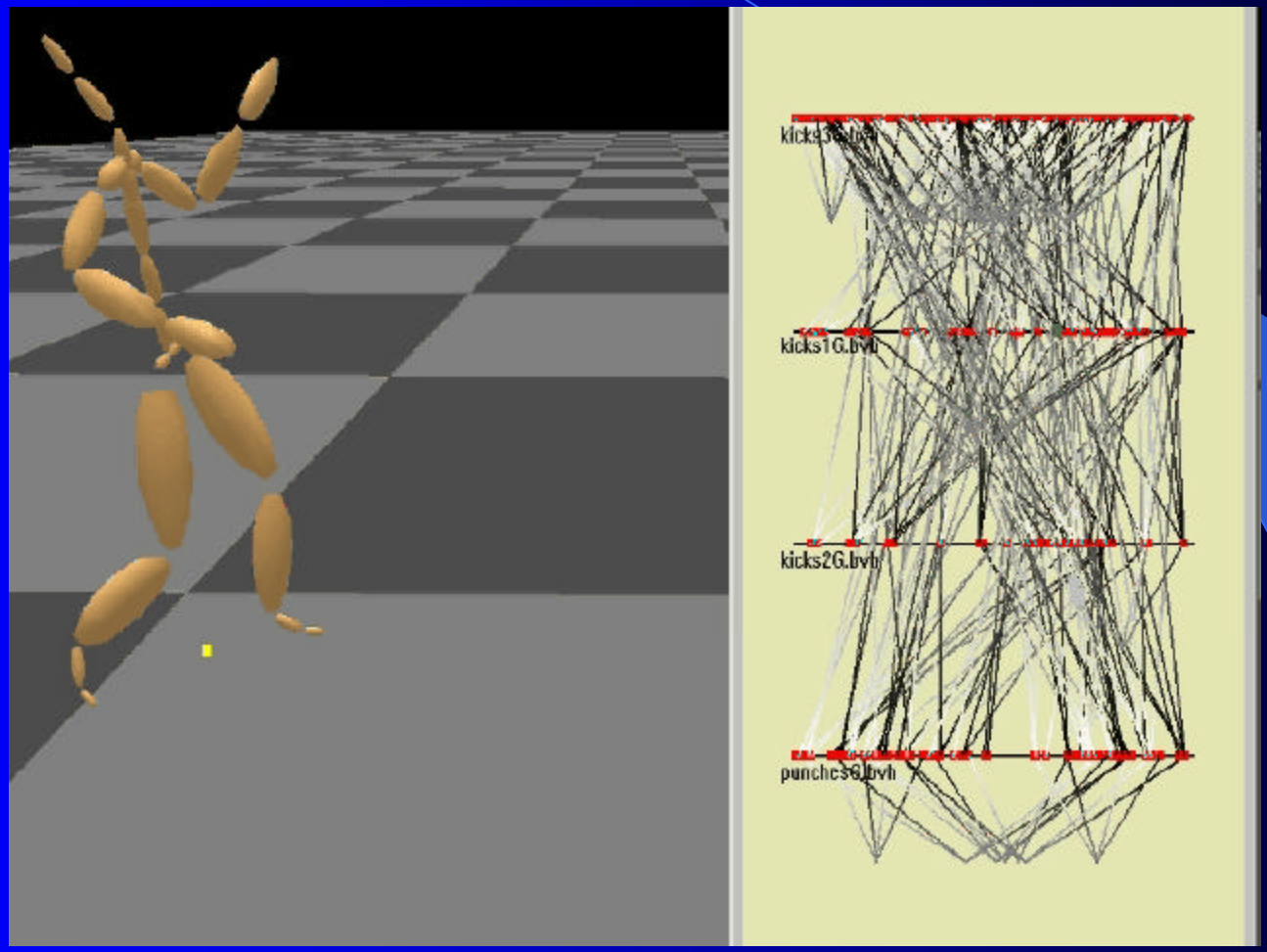
Spatial Mapping (Changhee Han)

- Use edge detection to generate a 2 ½ D map
- Use 2 ½ D map to generate local ASRs
- Also generate residual ASRs

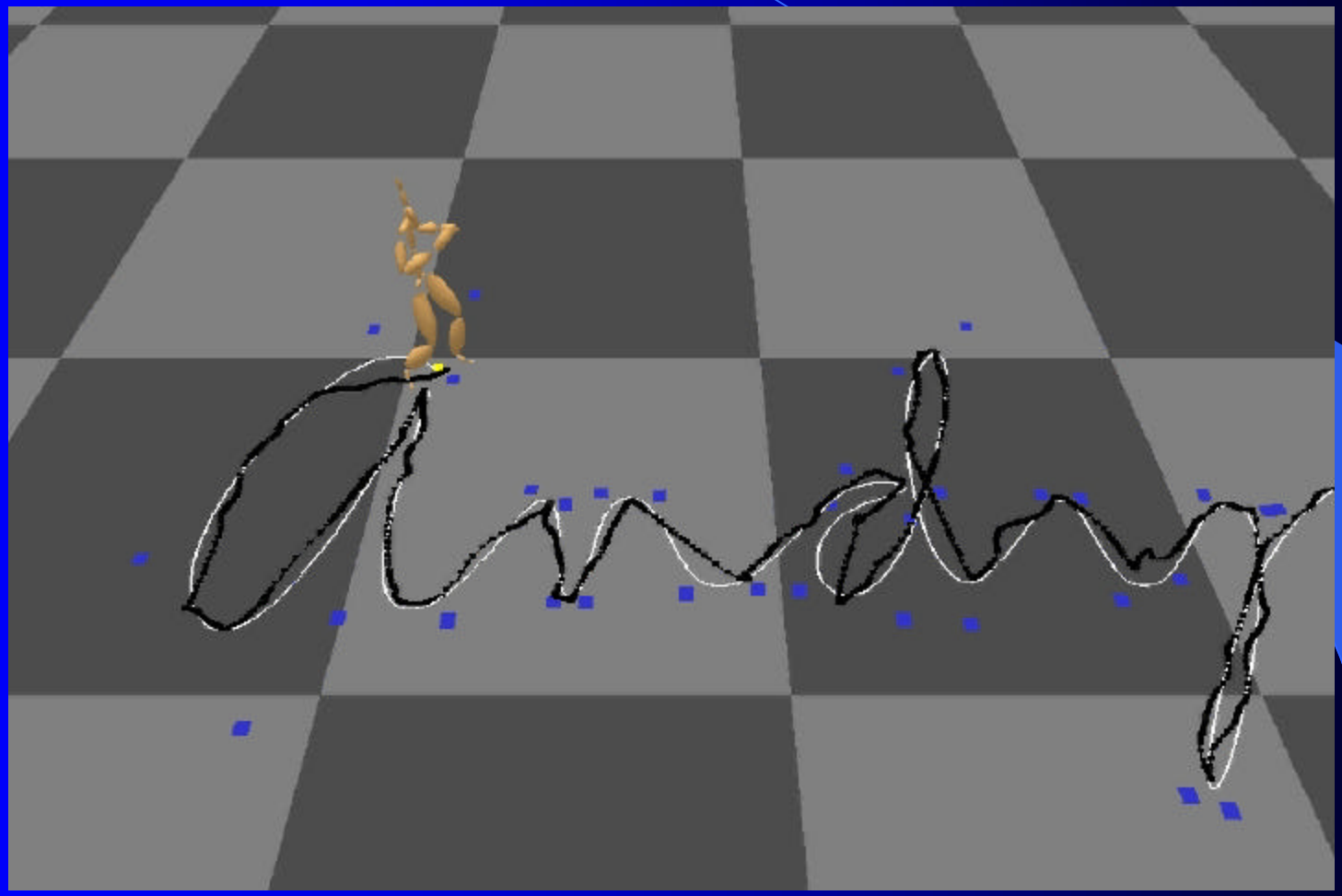


Spatial Mapping Movie

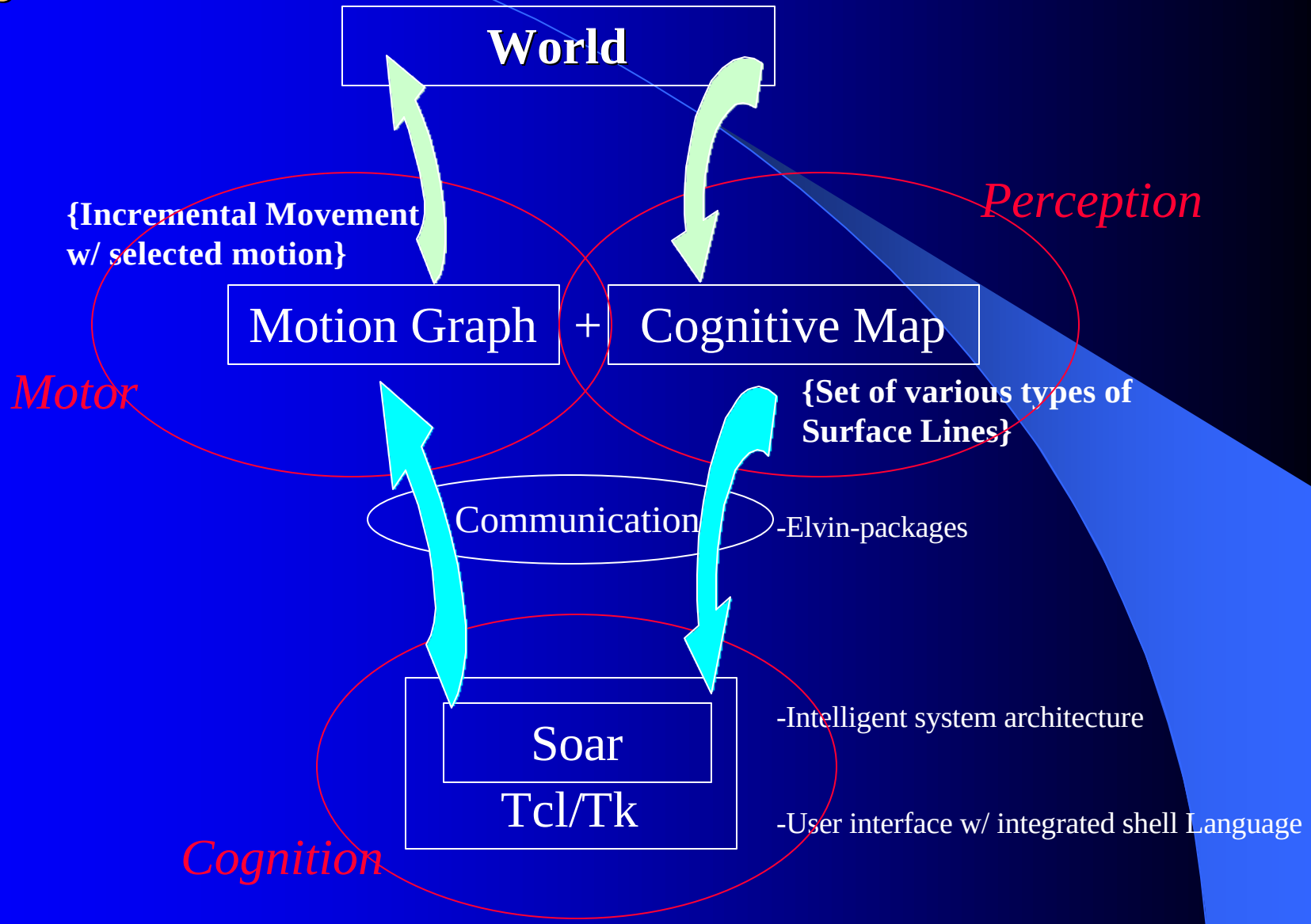
Motion Graphs (Fred Pighin)



Motion Graphs (Fred Pighin)



System of Reactive Incremental Movement Planning …



Soar (*a cognitive map related part*) interaction with Motion Graph

- Motion Graph API to accept
  - line-segment-based paths
  - Motion style information

Motion Graph interaction with World

- Smooth motion along *intelligent* paths
- Appropriate stylistically-varying motion along said paths

(In Summary from previous 2 slides)

A structure of Interfaces (*Input-link / Output-link*) in Soar

Input-link data received from CoMap

- -Exit
- -Surface
- -Type of place

Output-link data to give to MoGraph

- -Motion style info
  :e.g., decreasing run, crawl, cautious walk
- -line segment-based path

Nuggets and Coal

- Nuggets
  - Spatial mapping module is ready
  - Motion graph module is ready
  - MRE provides lots of infrastructure
- Coal
  - Need to define the interfaces:
    - Spatial mapping <-> Soar
    - Soar <-> Motion graphs
    - Spatial mapping <-> Motion graphs
  - Need to put it all together