

Real Time Behavior with State-Action Map

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Our purpose of participation in RoboCup (Robot Soccer World cup) is to study image processing, decision making, and the other methods that enable a small quadruped robot, ERS-7, to behave wisely in the constraint of real time computation.

For real-time behavioral decision of robots, we have used a state-action map, which records appropriate behavior for every state of the robot and its surroundings. A robot which is installed a state-action map decides its behavior very quickly by referring to the map.

We have used dynamic programming (DP) for building a state-action map. Fig. 1 shows the behavior of a forward robot, which approaches the ball to become an advantageous position for the shot, with a state-action map.

However, a state-action map is too large to be loaded on the memory of common robots. To solve this problem, we have used vector quantization (VQ) method for compression of the state-action map. Fig. 2 shows an example of State-Action Map (2D Map) compression with VQ. In this example, the original State-Action Map is compressed to about 30% size.

Keywords: Dynamic programming, State-Action Map, Vector Quantization

References

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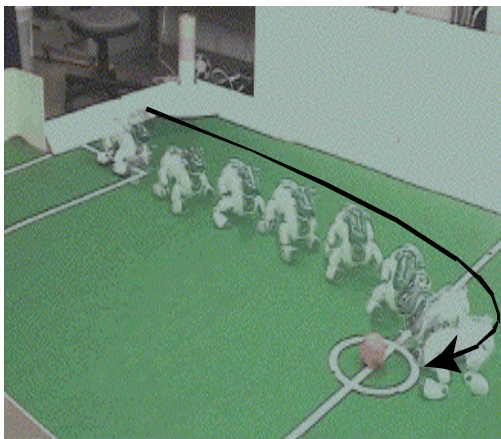


Fig. 1 Behavior of a forward Robot

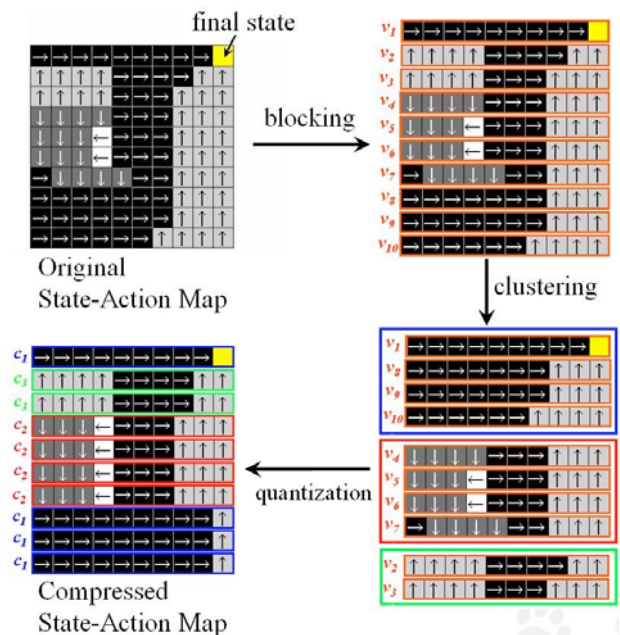


Fig. 2 VQ for State-Action Map(2D) Compression