

Learning multiple tasks by self-goal-setting based on self-evaluation

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Abstract—Humans can learn how to solve tasks autonomously; these tasks include those with changing goals that require different strategies corresponding to the goal. Several researchers have reported that setting the goal themselves improves the performance of learning; however, it remains unclear how an artificial agent can set goals by itself. Therefore, we aim to build a learning model that self-sets the target. An agent using the model attempts to reach different targets and detect the boundary of areas that contain easy targets and difficult ones. This agent also selects the target near the boundary and attempts to reach an easy target at first and a difficult one later; further, it aims to learn the task efficiently. To verify the proposed method, we compared our method with a method that randomly sets the target in a Continuous-Mountain-Car environment. Results indicated that our method improved the agent’s capacity to complete various tasks.

Index Terms—Reinforcement learning, Goal setting, Curriculum learning, Self-evaluation, Multiple tasks

I. INTRODUCTION

Humans can learn how to solve a task autonomously even if the goal of the task changes (multi-tasks) and the task requires different strategies corresponding to the goal. Agents with such a learning capacity are useful; however, building these agents is still a challenge. The effective learning methods used by humans may help address this challenge.

Goal setting is a crucial element in human learning [1]. This study claims that goal setting affects learning performance. Thus, we aim to develop a method of learning a task with a changing goal that requires different strategies to autonomously set an appropriate goal.

The main contribution of this extended abstract is to propose such a learning method (Figure 1) and to demonstrate the experimental results of learning a task using the proposed method.

II. RELATED WORK

Agents can learn how to solve a task automatically using reinforcement learning algorithms [2]. Humans should design the reward of the task to give these agents the goal of the task

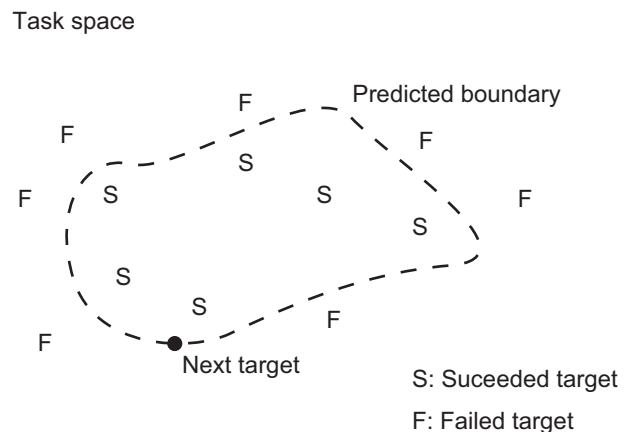


Fig. 1. Main concept of the proposed method

and the agents learn to solve only the task in most cases of reinforcement learning.

Intrinsic motivation (IM) [3] can help set the rewards for agents autonomously. Researchers have reported that using IM increases the speed of learning [4]. Using IM, agents can predict its next state, calculate prediction errors, and select an action to reach the state with the largest prediction error; then, these agents can decrease the prediction errors. However, learning to solve the task requires any additional rewards.

Agents can learn to solve a task efficiently by setting sub-goals of this task in curriculum learning [5]. It remains unclear to set autonomously the sub-goals so that humans set these sub-goals in most cases of curriculum learning.

As described above, to the best of the authors knowledge, no learning method to autonomously set sub-goals has been established so far.

III. METHOD

Setting an easy goal for an agent allows the agent to solve a task; however, it may not improve the skill of the agent. In contrast, setting a difficult goal for the agent does not allow the agent to solve the task and also may not improve their skill.

