VISVESVARAYA TECHNOLOGICAL UNIVERSITY
Jnana Sangama, Belagavi - 590018

PROJECT ENTITLED

"Intelligent Autonomous Game Bots using Deep Q Reinforcement Learning"

Submitted in partial fulfillment of the requirements for the award of degree of

BACHELOR OF ENGINEERING
in
COMPUTER SCIENCE AND ENGINEERING

For the Academic year 2016-2017
Submitted by:

1. Adarsh Trivedi	1MV13CS004
2. Aditya Roy Choudhary	1MV13CS005
3. Amit Asish Bhadra	1MV13CS014
4. Karan Saxena	1MV13CS047

Project carried out at
Sir M. Visvesvaraya Institute of Technology
Bangalore - 562157

Under the guidance of
Prof. Dilip K Sen.
HOD, Department of CSE
Sir M Visvesvaraya Institute of Technology, Bangalore

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DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

<u>CERTIFICATE</u>

It is certified that the project work entitled "**Intelligent Autonomous Game Bots using Deep Q Reinforcement Learning**" is carried out **by Adarsh Trivedi (1MV13CS004), Aditya Roy Choudhary (1MV13CS005), Amit Asish Bhadra (1MV13CS014), Karan Saxena (1MV13CS047)** bonafide student of **Sir M Visvesvaraya Institute of Technology** in partial fulfilment for the award of the Degree of Bachelor of Engineering in Computer Science and Engineering of the **Visvesvaraya Technological University**, Belagavi during the year 2016-2017. It is certified that all corrections and suggestions indicated for Internal Assessment have been incorporated in the report deposited in the department library. The project report has been approved as it satisfies the academic requirements in respect of project work prescribed for the course of Bachelor of Engineering.

Prof. Dilip K. Sen   **Prof. Dilip K. Sen**   **Prof. K.R. Kini**
Internal Guide   HoD   Principal
HoD, Dept of CSE   Dept of CSE   Sir MVIT
Sir MVIT   Sir MVIT   Bangalore

Name of the examiners   **Signature with date**

1)

2)

DECLARATION

We hereby declare that the entire project work embodied in this dissertation has been carried out by us and no part has been submitted for any degree or diploma of any institution previously.

Place: Bangalore

Date:

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ABSTRACT

Deep Reinforcement Learning has recently become a really hot area of research, due to the huge amount of breakthroughs in last couple of years. By feeding sufficient data into deep neural networks, it is often possible to learn better representations than handcrafted features. Our goal is to connect a reinforcement learning algorithm to a deep neural network which operates directly on RGB images and efficiently process training data by using stochastic gradient updates. The main idea of DQN is to compress Q-table by learning to recognize in-game objects and their behaviour, in order to predict delayed reward for each action given the state.

The method of learning goal-directed behaviour in environments with sparse feedback is a major challenge for reinforcement learning algorithms. The primary difficulty arises due to insufficient exploration, resulting in an agent being unable to learn robust value functions. Intrinsically motivated agents can explore new behaviour for its own sake rather than to directly solve problems. Such intrinsic behaviours could eventually help the agent solve tasks posed by the environment. We present a parallel-DQN, a framework operating at different temporal scales, with intrinsically motivated deep reinforcement learning. A top-level value function learns a policy over intrinsic goals, and a lower-level function learns a policy over atomic actions to satisfy the given goals. This provides an efficient space for exploration in complicated environments.