



Addis Ababa Institute of Technology (AAiT)

School Of Information Technology And Engineering

AI Individual Assignment

BFS, DFS, Dijkstra and A* search

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Section: 2

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AI Assignment

- 1) Identify two very different existing AI systems and characterize them based on the PEAS problem formulation. Give a detailed explanation of the applications based on these four fundamental concepts.

1.1 Aibo (Advanced Intelligence Robot)

Introduction

Aibo looks like a puppy, albeit a robot approximation. It **makes vaguely dog-like sounds, walks around, plays with toys, responds to commands, occasionally misbehaves, and uses cameras and facial recognition technology to interact differently with each person it encounters**

Performance Measure:

Human interaction with AIBO determines its ability to express its needs and emotions, as well as its ability to learn and mature. AIBO is capable of **expressing happiness, sadness, anger, surprise, fear, and dislike**. Just like a pet that's alive, the more interaction AIBO has with humans, the faster it learns.

Environment:

Aibo is **a friendly robotic dog whose personality and behavior evolves over time**. It can recognize its owner's face, detect smiles and words of praise, and learn new tricks. And of course, it loves to be petted.

Sensor:

ToF sensor, 2 Ranging sensors,

Pressure-sensitive/capacitive type touch sensor (Back sensor),

Capacitive type touch sensor (Head sensor, jaw sensor)

6 axis detection system (3 axes gyro / 3 axis acceleration)×2 (Head、Torso)

Motion sensor, Light sensor, 4 Paw pads

Sensors:

The robot includes 22 drive actuators that unlock realistic expressivity and enable advances in Aibo's physical capabilities. From tilting its head to twisting its haunches, Aibo's movements exude emotion. Despite its complexity, Aibo embodies a simple, organic look thanks to its fluid curves. Embracing the concept of "vitality," the design fuses AI and mechatronics into a new story of human-robot companionship.

Data for the Benchmark

Original grapg

Trial #	Bench mark	BFS	DFS	Dijkstra's	A*
1.	Average solution length	11.0	11.321052631578947	4.936842105263158	4.947368421052632
	Average solution time	1.0159768556293689e-05	1.2890916121633429e-05	0.0001038996796858938	0.00014167835837916324
2.	Average solution length	11.0	11.321052631578947	4.936842105263158	4.947368421052632
	Average solution time	1.61164685299522e-05	1.7371930574115954e-05	9.635373165732936e-05	0.00012786325655485454
3	Average solution length	11.0	11.321052631578947	4.936842105263158	4.947368421052632
	Average solution time	1.3990778672067743e-05	1.7653640947843853e-05	9.707212448120117e-05	0.0001319659383673417

1X + Original Graph(40 nodes)

Trial #	Bench mark	BFS	DFS	Dijkstra's	A*
1.	Average solution length	86.21052631578948	90.77368421052631	17.96578947368421	20.74736842105263
	Average solution time	0.00015081669154920076	0.00016082148802907842	0.0008074252228987845	0.0017674697072882402
2.	Average solution length	86.21052631578948	90.77368421052631	17.96578947368421	20.74736842105263
	Average solution time	0.00014805480053550318	0.00012111224626239977	0.0008290253187480726	0.0016436281957124409
3	Average solution length	86.21052631578948	90.77368421052631	17.96578947368421	20.74736842105263
	Average solution time	0.00014627419020000256	0.00012242103877820466	0.0008369539913378264	0.0017459888207285027

2X + Original Graph(60 nodes)

Trial #	Bench mark	BFS	DFS	Dijkstra's	A*
1.	Average solution length	288.7894736842105	294.7894736842105	42.10263157894737	50.43157894736842
	Average solution time	0.0005643330122295178		0.002959852469594855	0.00532559030934384
2.	Average solution length	288.7894736842105	294.7894736842105	42.10263157894737	50.43157894736842

	Average solution time	0.0005764898500944 439	0.000538005326 9235712	0.0027048468589 782717	0.005125548337635 241
3	Average solution length	288.7894736842105	294.7894736842 105	42.102631578947 37	50.43157894736842
	Average solution time	0.0005660615469280 042	0.000551358022 1878855	0.0029681450442 263953	0.004965997997083 162

3X + Original Graph(80 nodes)

Trial #	Bench mark	BFS	DFS	Dijkstra's	A*
1.	Average solution length	681.8947368421053	712.9973684210 527	80.55	92.88421052631578
	Average solution time	0.0010857224464416 505	0.007266732266 074733	0.0068979702497 78346	0.012278417537086 889
2.	Average solution length	681.8947368421053	712.9973684210 527	80.55	92.88421052631578
	Average solution time	0.0010692019211618 524	0.001022596735 7033177	0.0076168449301 468695	0.012524782983880 293
3	Average solution length	681.8947368421053	712.9973684210 527	80.55	92.88421052631578
	Average solution time	0.0011243412369175 96	0.007350449185 622366	0.0029681450442 263953	0.012391902271069 979

4X + Original Graph(100 nodes)

Trial #	Bench mark	BFS	DFS	Dijkstra's	A*
1.	Average solution length	1328.6842105263158	1467.960526315 7894	122.78947368421 052	146.0026315789473 6

	Average solution time	0.0018834390138324937	0.0016558697349146794	0.014451441011930766	0.026435297413876183
2.	Average solution length	1328.6842105263158	1467.9605263157894	122.78947368421052	146.00263157894736
	Average solution time	0.0018414265231082314	0.001984596879858719	0.014516206164109079	0.024595910624453897
3	Average solution length	1328.6842105263158	1467.9605263157894	122.78947368421052	146.00263157894736
	Average solution time	0.002302458411768863	0.0017772040869060315	0.018181618891264264	0.02820694823014109







