SUCKYCORP AGENTS PERFORMANCE

This report evaluates the performance of four SuckyCorp agents of NoSenseAgent, OmniscientAgent, SensingAgent, and WorldModelAgent across various environmental conditions characterized by varying levels of dirt density from 0.1 to 0.4 and wall density from 0.1 to 0.3. and evaluated the performance of changing battery capacity on the performance of the most popular Memory Sucky model i.e WorldModelAgent, by varying the battery levels from 1000, 500, and 250 to see the effect of raising and lowering the battery capacity.

The OmniscientAgent proved to be the most effective across all tested environments, consistently achieving the highest scores, particularly in scenarios with high dirt density and complex wall structures. Its performance highlights its ability to navigate and clean efficiently, even in the most challenging conditions. On the other hand, the NoSenseAgent performed poorly, with significantly lower and inconsistent scores, especially in more demanding environments. Its lack of adaptability to varying levels of dirt and wall complexity made it the least effective of the agents. The SensingAgent and WorldModelAgent both demonstrated moderate effectiveness, but the WorldModelAgent stood out by performing better in more difficult conditions. This agent showed superior adaptability and effectiveness in environments with higher dirt density and intricate wall patterns, making it better suited for challenging scenarios compared to the SensingAgent.

Increasing the battery capacity of the WorldModelAgent enhances its performance, especially in environments with high dirt and wall densities. Specifically, when the battery capacity reaches 1000 units where adding more battery doesn't lead to as much improvement as before. Essentially, while a larger battery helps the agent work longer and perform better.

Supporting Analysis

Agents Performance on Different Environmental Conditions

- **NoSense Agent:**

The NoSense agent exhibits generally low average scores across varying dirt and wall densities, with significant variability in performance. While it performs slightly better as wall density increases at lower dirt levels, its scores remain consistently low. The agent's performance peaks at a dirt density of 0.4 and wall density of 0.1, where it achieves its highest average score of 51.67, but this comes with a high variance, indicating inconsistency. Overall, the NoSense agent struggles to adapt to more challenging environments, showing limited effectiveness with considerable fluctuations in performance. Here is the tabular representation of average score and variance score of different levels of dirt density and wall density.

Dirt Density	Wall Density	Average Score	Variance Of Score
0.1	0.1	15.00	116.71
	0.2	34.00	737.78
	0.3	36.00	337.78
0.2	0.1	12.00	62.22
	0.2	30.00	333.33
	0.3	33.00	578.89
0.3	0.1	7.00	67.78
	0.2	17.00	312.22
	0.3	35.00	405.56
0.4	0.1	51.67	945.40
	0.2	36.00	227.78
	0.3	35.00	405.56

- **Sensing Agent:**

The Sensing agent shows a moderate effectiveness across varying dirt and wall densities, with a tendency to perform better as the environment becomes more complex, particularly at higher wall densities. It achieves its highest average scores at higher dirt densities, such as 0.4, with a clear peak at a wall density of 0.1 where it scores 187.0. However, the performance of the Sensing agent is marked by high variance, indicating inconsistency, especially in more challenging environments. Here is the tabular representation of average score and variance score of different levels of dirt density and wall density.

Dirt Density	Wall Density	Average Score	Variance Of Score
0.1	0.1	74.00	1026.67
	0.2	115.00	2405.56
	0.3	173.00	5712.22
0.2	0.1	44.00	560.00
	0.2	107.00	2778.89
	0.3	131.00	4876.67
0.3	0.1	27.00	467.78
	0.2	45.00	738.89
	0.3	61.00	1698.89
0.4	0.1	187.00	6138.97
	0.2	173.00	5712.22
	0.3	61.00	1698.89

- **WorldModel Agent:**

The world model agent shows strong performance across varying dirt and wall densities, particularly excelling in more challenging environments with higher dirt and wall densities. Its average scores are consistently high, peaking at 297.0 at a dirt density of 0.4 and wall density of 0.1. However, this agent also exhibits significant variance in its performance, particularly in more complex environments, here is the tabular representation of average score and variance score of different levels of dirt density and wall density.

Dirt Density	Wall Density	Average Score	Variance Of Score
0.1	0.1	129.00	1098.89
	0.2	205.00	2694.44
	0.3	244.00	10493.33
0.2	0.1	91.00	2054.44
	0.2	180.00	1000.0
	0.3	199.00	5698.89
0.3	0.1	45.00	1761.11
	0.2	80.00	4311.11
	0.3	131.00	6454.44
0.4	0.1	297.00	10431.61
	0.2	244.00	10493.33
	0.3	131.00	6454.44

- **Omniscient Agent:**

The Omniscient Agent consistently delivers high performance across all environmental conditions, with average scores remaining strong even as dirt and wall densities increase. It achieves its highest average scores at lower dirt densities combined with higher wall densities, such as 268.0 at dirt density 0.1 and wall density 0.2. However, the variance in its performance increases significantly in more complex environments, particularly at higher wall densities, indicating some inconsistency under more challenging conditions. here is the tabular representation of average score and variance score of different levels of dirt density and wall density.

Dirt Density	Wall Density	Average Score	Variance Of Score
0.1	0.1	247.00	690.00
	0.2	268.00	1128.89
	0.3	240.00	9044.44
0.2	0.1	182.00	4328.89
	0.2	227.00	667.78
	0.3	230.00	7533.33
0.3	0.1	107.00	5690.0
	0.2	137.00	7312.22
	0.3	123.00	7667.78
0.4	0.1	265.00	9174.83
	0.2	240.00	9044.44
	0.3	123.00	7667.78

- **Impact of Battery Capacity on WorldModelAgent**

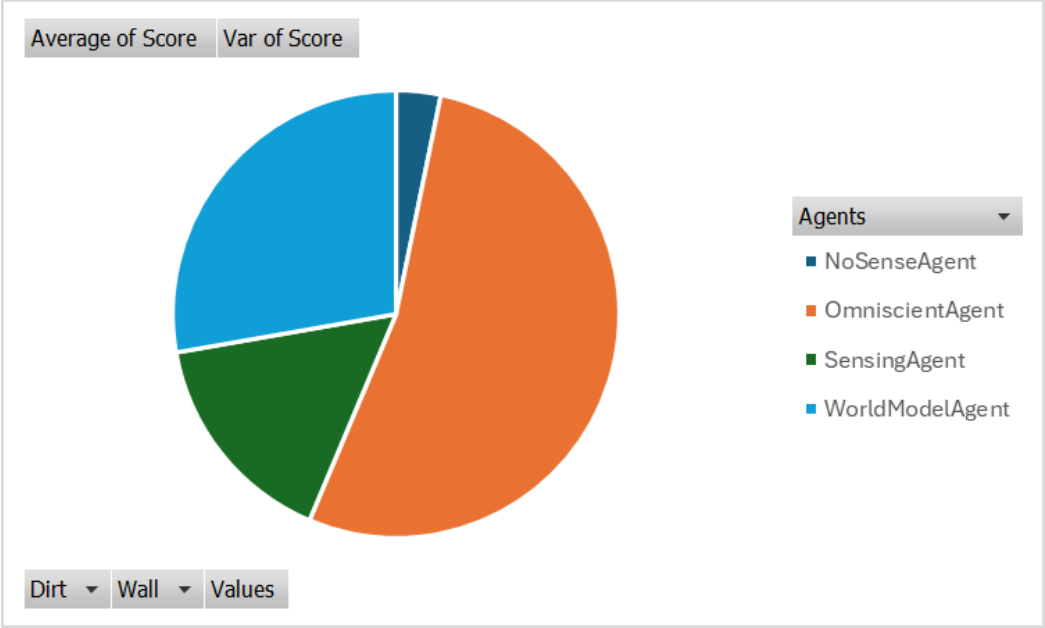
Increasing the battery capacity of the WorldModelAgent, the most popular Memory Sucky model, significantly enhances its performance, particularly in challenging environments with higher dirt and wall densities. For instance, at a battery capacity of 250 units, the agent's average scores range from 45 to 123, with a high variance in performance ranging from 1012.07 to 2956.67, indicating inconsistent effectiveness, especially in more demanding environments. When the battery capacity is increased to 500 units, the agent's average scores improve significantly, ranging from 82.33 to 221, and the variance increases to a range of 2528.85 to 13898.89, reflecting more powerful but somewhat less consistent performance.

However, as the battery capacity is further increased to 1000 units, the performance gains continue but start to show diminishing returns. The average scores at this capacity range from 159 to 462, indicating the agent's ability to perform well even in the most challenging environments. However, the variance in scores also increases significantly, ranging from 8432.22 to 28179.89, suggesting that while the agent achieves better results, the consistency of these improvements is less predictable. This suggests that while more battery capacity enables better overall performance, the benefits become less significant relative to the cost of adding additional capacity, pointing to an optimal balance.

Battery Capacity	Wall Density	Dirt Density	Average of Score	Variance of Score
250	0.1	0.1	65.00	1072.22
		0.2	45.00	1012.07
		0.3	47.00	1667.78
		0.4	123.00	2956.67
500	0.2	0.1	82.33	2528.85
		0.2	212.00	3417.78
		0.3	157.00	5090.00
		0.4	221.00	13898.89
1000	0.3	0.1	159.00	8432.22
		0.2	263.33	23071.26
		0.3	462.00	14684.44
		0.4	348.33	28179.89

Overall Graphical representation of agent’s performance the pie chart illustrates the distribution of average scores and variances among four agents of NoSenseAgent, OmniscientAgent, SensingAgent, and WorldModelAgent. The Omniscient agent, which is represented with orange dominates the chart, indicating that it has the highest overall performance among the agents. The WorldModel Agent which is in blue also shows significant performance, though less than the OmniscientAgent, while the sensing Agent in green has moderate representation, reflecting its

moderate effectiveness. The NoSense agent in light blue occupies the smallest portion, which demonstrates its lower effectiveness compared to the others. This visual summary highlights the clear performance among the agents, with Omniscient agent leading and WorldModel agent are second highest when compared to the other two agents.



Conclusion:

An analysis of SuckyCorp's agents reveals that OmniscientAgent is the top performer, excelling in complex environments with high dirt and wall densities. The WorldModelAgent also performs well, especially with increased battery capacity, it can be considered as the best agent in terms of cost efficiency which is more reliable though benefits taper off beyond a certain points. The SensingAgent shows moderate effectiveness but with some inconsistency, while the NoSenseAgentstruggles in challenging conditions, showing high variability.

To enhance the WorldModelAgent, future efforts should focus on refining its algorithms for better consistency, particularly in complex environments, and finding an optimal balance between battery capacity and cost. Additionally, improving the adaptability of the SensingAgent and WorldModelAgent to a wider range of environments could help close the performance gap with the OmniscientAgent. Expanding testing conditions, by adding new challenges, like moving obstacles, can help us better understand the strengths and weaknesses of each SuckyCorp agent. By testing the agents in more varied and complex scenarios, we can see how well they adapt to unexpected changes in their environment. This deeper understanding will guide us in improving the agents, making them more efficient, adaptable, and cost-effective by pushing the agents to handle tougher tasks, and where they need improvement, ultimately leading to better and more reliable products.