

GAME AI: NUNCABOLA

-Ajinkya & Chinmaya

0:55⁷⁸

3 Coins
47 Goal

Agenda:

- Game & Problem Statement
- Tasks and Techniques
- Evaluations
- Conclusions
- Questions

GamePlay & Problem Statement

- Based on moving ball using gravity by tilting the game world, not directly controlling the ball.
 - Ball rolls on the platform and collect coins, ultimately reaching the goal.
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- To build an AI which plays this game intelligently.
 - We will limit ourselves to flat level to avoid physics simulations.

Tasks and Techniques Used

- Movement
 - Tilt-based Seek vs Arrive
- Grid construction using bounding-box projection.
 - To handle open edges, we scaled down the resultant grid.
- Path-Finding
- Path-Following
 - Greedy solution to TSP,
 - Keeping track of optimal path and branching out to collect coins (path-optimized approach).
- Decision Making
 - Coin selection based on its value, velocity of ball.
 - Blending variables to prioritize tilt's smoothness, ball's momentum, Coin value, remaining game time and distance of ball from goal.

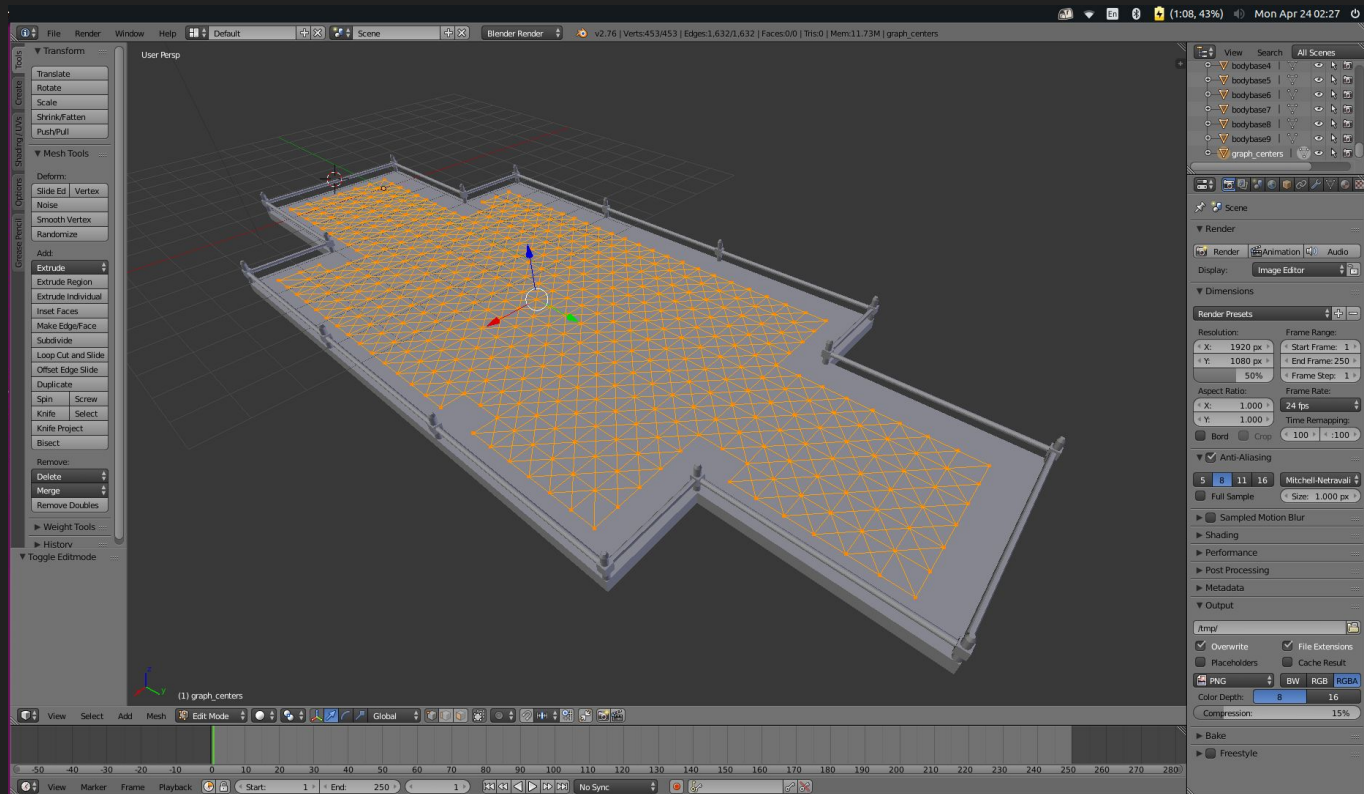
Evaluations : Seek vs Arrive

https://www.youtube.com/watch?v=4h_y_8KVkpo

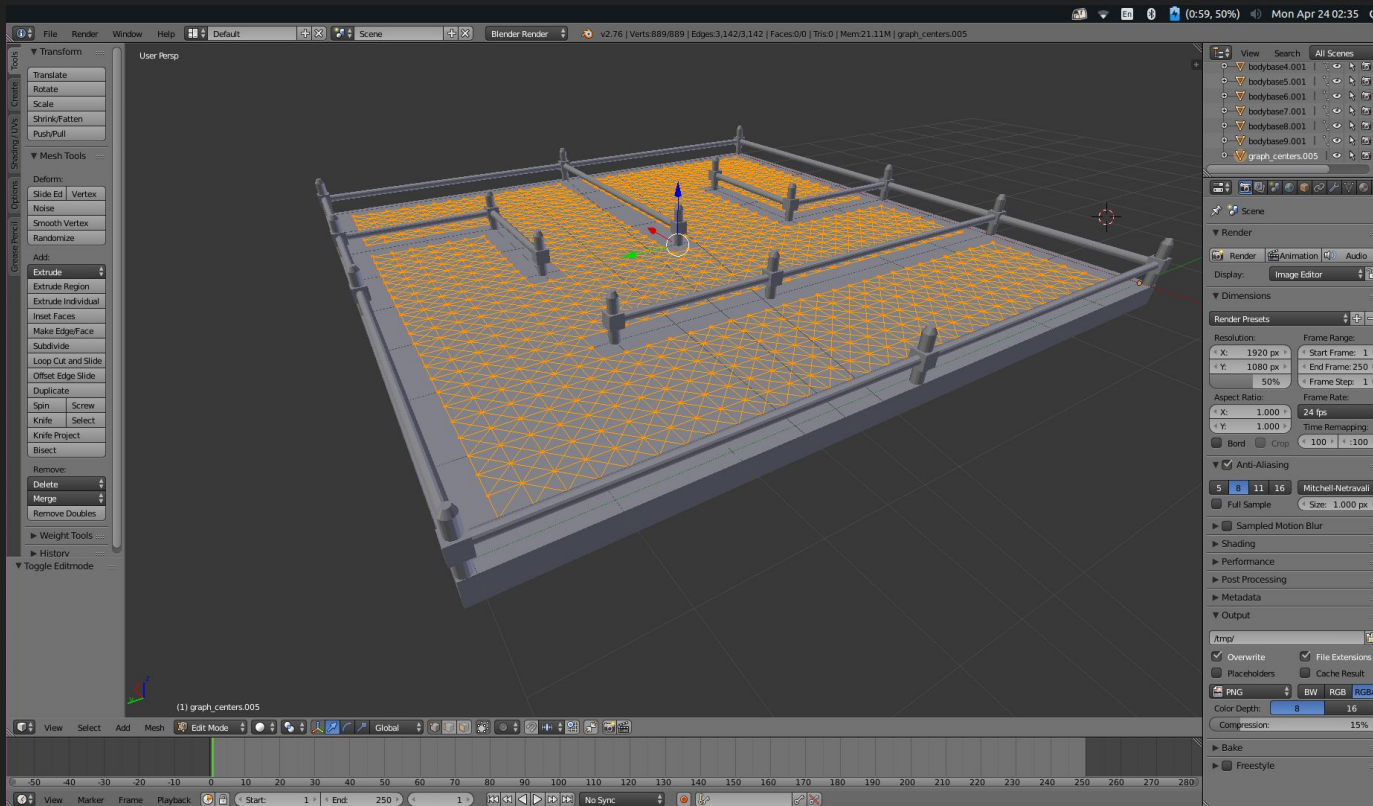
<https://www.youtube.com/watch?v=zBD8RBodUGg>



Sample Level (1)



Sample Level (2)



Parameter tuning

- Tilt angle smoothing
- Tendency to conserve momentum
- Orthogonal momentum compensation by changing tilt axis
- Coin collection and path following thresholds
- Changing tilt angle according to velocity and destination
- Extra coin collection time cutoff (dynamically computed)
- Closest coin distance calculation
- Utility calculation for path-optimized approach

Evaluations (continued...)

- Performance of Tilt-based Seek vs Arrive
- Performance of Wander vs Greedy TSP (w/ A^*) vs path-optimized approach.
 - Average of 50 runs
 - Wander (sometimes doesn't collect enough coins)
 - Greedy TSP with A^* : 58 seconds (sample level (2))
 - Path-optimized approach: 70 seconds (sample level (2))

Evaluation: Greedy vs Path-Optimized



<https://www.youtube.com/watch?v=vzQ8Nkbj0nA>

<https://www.youtube.com/watch?v=meMySO8Sbcs>

Conclusion

- Greedy turns out to be more efficient.
- More coins were collected using Greedy approach in a given time period.
- It is faster in terms of ball speed. Since the ball is able to maintain its momentum for most of the time.
- We initially hoped that path-optimized approach would be faster, but its tendency of getting back to the path made the ball constantly lose momentum.

Questions?



<https://www.youtube.com/watch?v=xPpRe2GPpeU>