

Tonopoly: A Monopoly-like Board Game with Toio

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ABSTRACT

We present Tonopoly, a monopoly-like board game using Toio robots. Tonopoly is a 2-4 player board game that ends in 10 rounds. Players need to collect stars to win the game. Players choose Toio robots as their characters and roll a dice to make their characters move. They can purchase items with money, and get or lose money when their characters step on certain squares. We provide three scenarios where players can get stars: purchase a star from a store, rob a star from other players, and get a star for free. Characters interact with other characters or physical objects in these scenarios. In addition, players can draw a card when they step on certain squares, after which they may get a chance to sabotage their opponents by 1) placing a mine on the track or 2) shooting other characters with cannons mounted on top of their characters. Tonopoly demonstrates the possibility of robot-robot and human-robot interactions in board games.

KEYWORDS

Human Robot Interaction, Tangible User Interface

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1 INTRODUCTION

Board games have been a popular form of entertainment. Though video games based on board games provide more audiovisual feedback and remote access, they lack the rich tangible interactions that board games provide. We propose Tonopoly, a Monopoly-like board game augmented by Toio. Tonopoly provides various audiovisual feedback as well as tangible interactions. Interaction between Toio robots and physical objects is also a part of the game. We present Tonopoly to provide a novel human-robot interaction to explore possible board game scenarios.

1.1 Goal

Tonopoly is played by 2-4 people. The goal of this game is to collect as many stars as possible. In the beginning, each player chooses a Toio robot as their character. Players collect items in the game,

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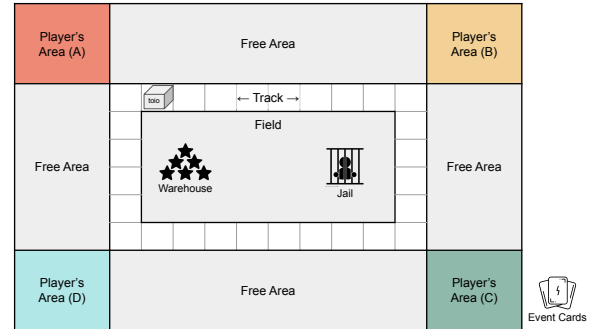


Figure 1: Tonopoly board and items.

some of which help them achieve their goals. Items include stars, money and event cards. Tonopoly ends in 10 turns, the player with the most stars at the end of the game wins. If more than one player has the same number of stars, the player with more money wins.

1.2 Environment

Tonopoly is played on a board formed by several Toio development mats (Figure 1). This board consists of 10 areas:

- *Field*. This is the rectangle area in the center of the board. A warehouse for stars and a jail is on the field.
- *Track*. It consists of contiguous squares surrounding the field. All players' characters will run on the track.
- *4 Player's areas*. There is a player's area next to each corner of the track. This is where players store their stars.
- *4 Free areas*. There is a free area next to each edge of the track. Some events occur in free areas.

A tablet displays statistics and notifications, provides touch input, and plays sound effects. The tablet's front camera scans QR codes on event cards.

1.3 Movement

Players take turns rolling a dice. The lights embedded in their characters indicate whose turn it is. The dice is embedded with an IMU and connects to the tablet via Bluetooth, so the system can know the value a player rolls. Once a player rolls the dice, their character moves around the board the corresponding number of squares. If the square a character is going to is already occupied, the character stops in the free area, parallel to the square. Every square on the board links to one of the events listed below. When a player steps on a square, the corresponding event is triggered.

- The player earns or loses money.
- The player's character advances or retreats several squares.

- The player’s character is sent to the other end of the pipe.
- The player draws an event card from the pile.
- The player can purchase a star at a store.

1.4 Event cards

Event cards are piled on the field. There is a QR code printed on the back of each card. Once a player draws a card from the pile, they have to scan the QR code with the tablet’s camera, then one of the following events is triggered.

- The player earns or loses money.
- The player’s character advances or retreats several squares.
- The player gets a star for free.
- The player can rob a star from another player that has stars.
- The player is sent to jail.
- The player can place a mine card.
- The player gets a chance to shoot another player’s character with a projectile.

1.5 Jail

When a player is sent to jail, their character also moves to the jail on the field. The player can not roll a dice or be robbed during their time in jail. After 3 turns, the player is freed, and their character returns to the square where it was before being sent to jail.

1.6 Money

Money can be used to purchase stars and determine the winner at the end of the game in case of ties. Each player has \$5 at the beginning of the game. A player can neither lose money nor purchase stars when they run out of money. Given the frequent transaction and granularity of money, statistics on money are displayed on the screen.

1.7 Stars

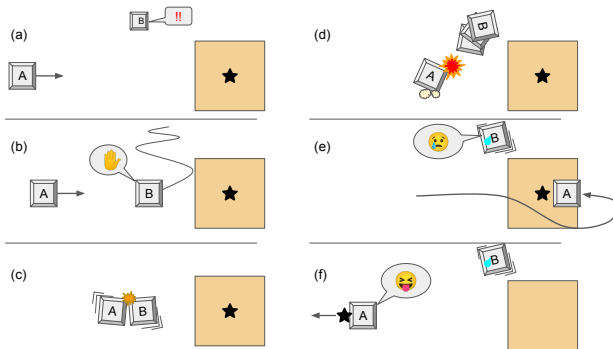


Figure 2: Character A robs a star from character B.

Stars are represented by tangible tokens. All stars are placed in the warehouse at the beginning. There are 3 ways a player may get or lose stars.

- Purchase a star at a store.
- Get a free star (triggered by an event card).
- Rob a star from another player (triggered by an event card).

When a player purchases a star or gets a star for free, a shopkeeper, represented by a robot, fetches a star from the warehouse to the player’s area. When a player robs a star from another player, their character (denoted as A) also robs a star from the other player’s character (denoted as B) (Figure 2). A robbery occurs in a free area next to B’s player’s area. This is what a robbery looks like:

1. A approaches B’s star. (Figure 2 (a))
2. B stands in A’s way to stop it. (Figure 2 (b))
3. A and B push against each other. (Figure 2 (c))
4. B trips and falls, and expresses sadness through body language. (Figure 2 (d), (e))
5. A pushes the star back to its player’s area, and expresses excitement through body language. (Figure 2 (e), (f))

1.8 Mines

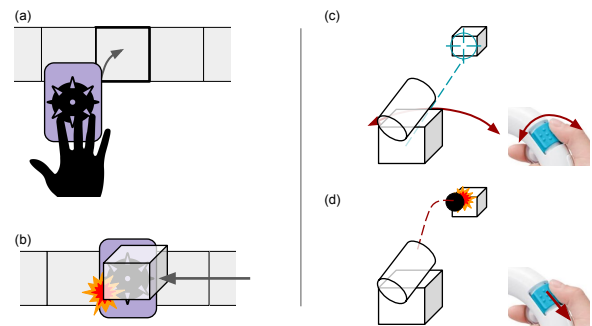


Figure 3: Methods to sabotage one’s opponents.

When a player draws a mine from the event card pile, they can place the mine on any square that is not occupied by a character (Figure 3 (a)). When a player’s character steps on the mine, the mine explodes, and the player loses \$15 (Figure 3 (b)).

1.9 Shooting Opponents with Projectiles

We will install cannons on top of all players’ characters. When a player draws a projectile card from the event card pile, their character enters shooting mode. In this mode, the player can aim and shoot a projectile with their Toio controller (Figure 3 (c), (d)). A player loses \$15 if their character gets shot.

1.10 Emotional Expression

Players can send commands from their controllers to make their characters express emotions. For example, teasing their opponents with the "dance of victory."

2 ADJUSTMENT FOR IMPLEMENTATION

Given that we can use a maximum of 4 Toio robots in SIC, we will have to adjust the game in response to the number of players in our implementation. If the game is played by 4 players, there is no shopkeeper at the store. Instead, the character who gets a star fetches it from the warehouse.