Transforming Solitary Exercises into Social Exergames

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Team Sports: ideal

Recreation, Entertainment, Physical ability, Sociability, ...
Solitary Exercises: real

Monotonous, Repetitive, Isolated
Games based on solitary exercises

Goals of this talk:
1. Sharing our observation on exergame design
2. Introducing our game ‘Swan Boat’ and design considerations
3. Evaluating how effectively the game was designed
Overview:
Observation on exergame design

1. Extracting and choosing design primitives from exercise
2. Building intuitive game mechanics for exergames
3. Arranging game play to keep exercisers motivated
Extracting and choosing design primitives

- Taking steps
- Swinging hands
- Current speed
- Elapsed time
- Total distance
- State of running

Wii Olympic: 100m sprint
Exercise < Game

Nike+
Exercise > Game
Building Intuitive Interactions

Which actions are fundamental to the exercise?
→ ‘Primary actions’

Tip 1. Preserve primary actions in core mechanics
Tip 2. Utilize additional actions carefully

Mueller et al., Table Tennis for Three [CHI2009]
Motivating Players: Micro Goals, Interactions between players

- Micro goals
  - Sense of achievement
  - Gauge of overall progress
  - Path for long-term goals

- Highly synchronized interactions between players

Keep exercisers motivated!

Interactions over very short time frames
Revisiting Design: Swan Boat

• Primary action: repetitive leg movements
• Key primitive: running pace
  (Utilized interactive treadmill)

Treadmill running

Swan Boat (Metaphor)

Collaborative Steering
Swan Boat (Cont’d):
Utilizing non-primary actions

Flapping together:
To rise back to the surface

Punching together:
To shove an opponent away
User Study

- 12 paid participants
  - 20-25 years old
  - 4 female, 8 male

- Four 20-minute sessions
  - Two sessions for playing Swan Boat
  - Two sessions for treadmill running on interactive treadmill

- Interviewed using open-ended questions
  - Intuitiveness of game interactions
  - Interactions between players (cooperation and competition)
  - Exercise effects

- Used MET (metabolic equivalent) for estimating energy expenditure
User Study: Intuitiveness of Game Interactions

- All of the participants agreed to the statements:
  
  “The game is intuitive to play”
  “The game is compatible with the running activity”

- About non-primary actions (punching, flapping):
  - No one complained about the confliction with primary actions
User Study: Cooperation and Competition Effects

- Cooperation side:
  
  “During the game play, we continuously discussed each other’s running speed” [P5]

  “I prefer to run at my own pace” [P2]

- Competition side:

  “When the opponents’ boat was gaining on us, we ran hard to stay in the lead” [P4]

  “Passing another boat just before reaching the goal was really thrilling” [P12]
User Study: Effects on the Exercise

- 54% higher energy expenditure while playing Swan Boat

![Bar chart showing energy expenditure comparison between Swan Boat and Treadmill running.]

- Imbalances between players’ physical ability

“\textit{I could not maintain my own pace while trying to catch up with the others’ boat. After the race, I realized that I exerted myself too much}” [P4]
Conclusion

• Suggested a holistic viewpoint on exercise and game interaction while designing and evaluating exergames

• Evaluated the effectiveness of the transformation guidelines
  • Results opened up practical issues to be covered

• Long-term study on motivation effect is further required