Development of Games

Lecture 20

Game Architecture

Outline

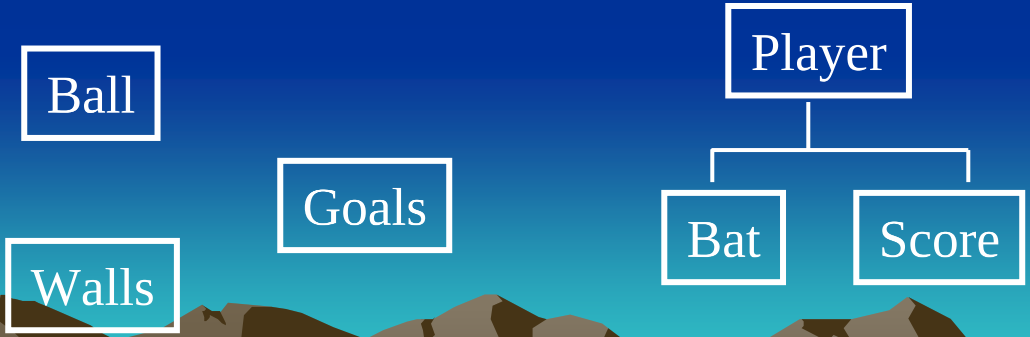
- Tokens
- Initial Architecture
- Development
- Nearing Release
- Postmortem

Game Decomposition

- Consider: *Pong, Frogger, Pac-Man, Missle Command, Zelda, Virtua Fighter, Warcraft, Doom …*
- What do they have in common?
  - All have a player (else a movie or screen saver)
  - All have discrete elements that can be directly or indirectly manipulated
  - Call these *tokens*
- Note, tokens == objects. Use “tokens”, since not always 1-to-1 mapping to software objects

Tokenizing Pong

- Bats, Score, Ball, Walls
  - Player moves Bat, changes score so sub-tokens
- Goals, too. Defined by area.
- All games can be tokenized (*Pac-Man* and *Balls!* in Rollings and Morris book)


Ball

Goals

Walls

Player

Bat

Score

(Game World
has rest)

Interactions of Tokens (1 of 2)

- Collisions are common
  - Token gets message telling collision occurred
- More interactions than collisions. Try token-token matrix (lower triangle)
  - If impossible, “X”
  - If symmetric, square
  - If asymmetric, triangles
- Events: Ball-Bat deflection, Wall-Bat stop, Wall-Ball deflection, Goal-Ball goal event, Goal→Score goal event. Note, Score→Goal is “X”
- Allows visual check for interactions.
  - See errors, missing interactions
  - Maybe unexpected chain reactions (could enhance game, could be unplayable)

Interactions of Tokens (2 of 2)

- Game World is token. Included in matrix. Needs to be informed of some events. Act as intermediary.
  - Also, objects don’t need to know all they may encounter. Makes it easier to update.
- Ex: Ball hits goal → goal generates goal event to Game world → game world generates score event sends to score → score increments total points
  - Could later add team score or high score object and goal would not need to know

Limitation of Token Matrix

- Can get complicated. Consider Pac-Man
- Tokens have one or more states
  - Ghosts *hunting*, *hunted*, *eaten*
- Some interactions more complicated
  - Pac-Man eats power pill → power pill event
  - Power pill event → ghost goes to hunted, timer reset
  - Hunted ghost eaten → eaten event to home base, calculates how many → score (200, 400…) → score to ghost to display

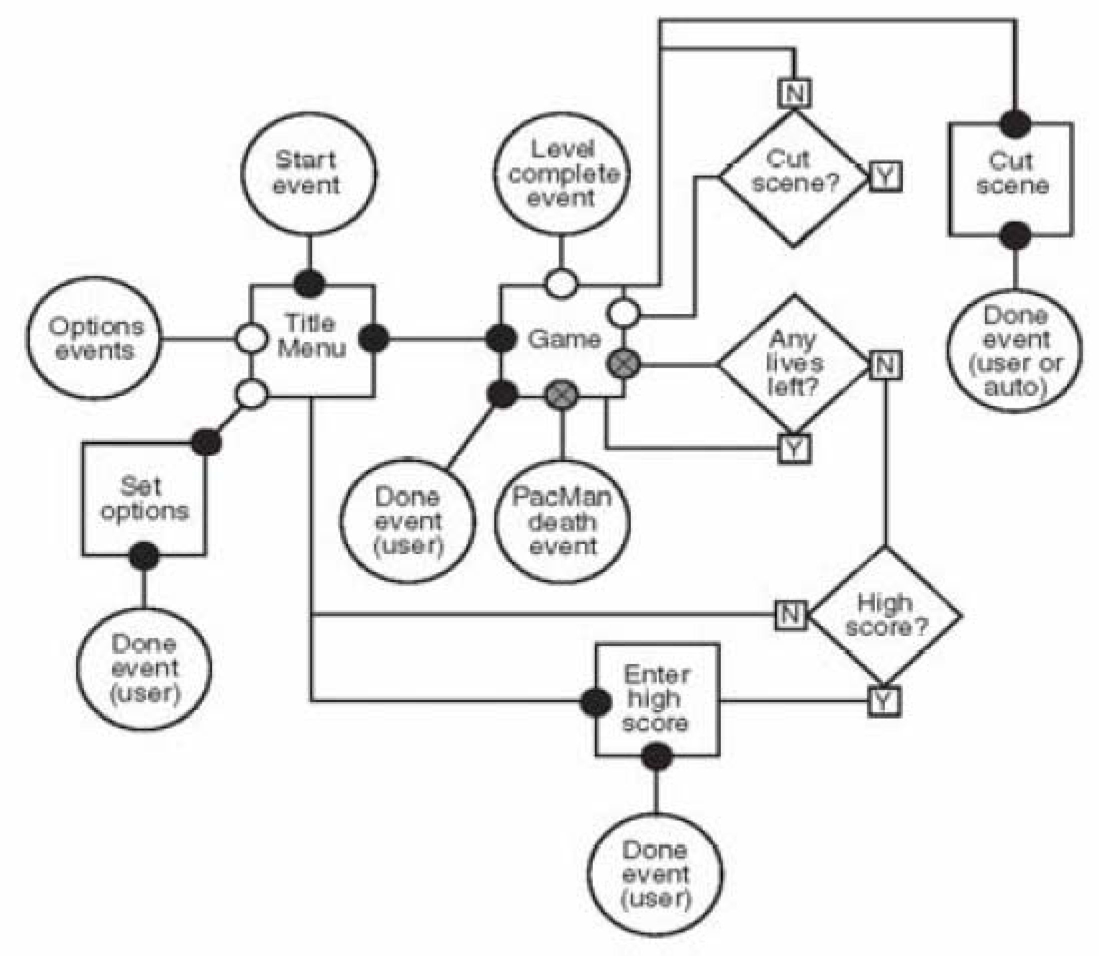
State Machine for Ghost Token

- Token Matrix gives you big picture
- Finite State Machine (FSM) gives you focus on specific area
- Single token and how rest of world interacts. Ex: ghost
  - Hunter – (pill) → Hunted
  - Hunted – (timer) → Hunter
  - Hunted – (pill) → Hunted (reset timer)
  - Hunted –(pacman) → Eaten
  - Eaten –(resurrect) → Hunter
- Eaten would trigger score event. That would appear in FSM of score token

State Machine for Pac Man

- Hunted – (power pill) → Hunter
- Hunter – (timer) → Hunted
- Hunter – (power pill) → Hunter (reset)
- Hunted – (ghost collision) → Dying
- Dying – (if lives > 0) → Reset Level event else Game Over event
- This is an “open” FSM, meaning can be a dead-end

State Machine for Game World

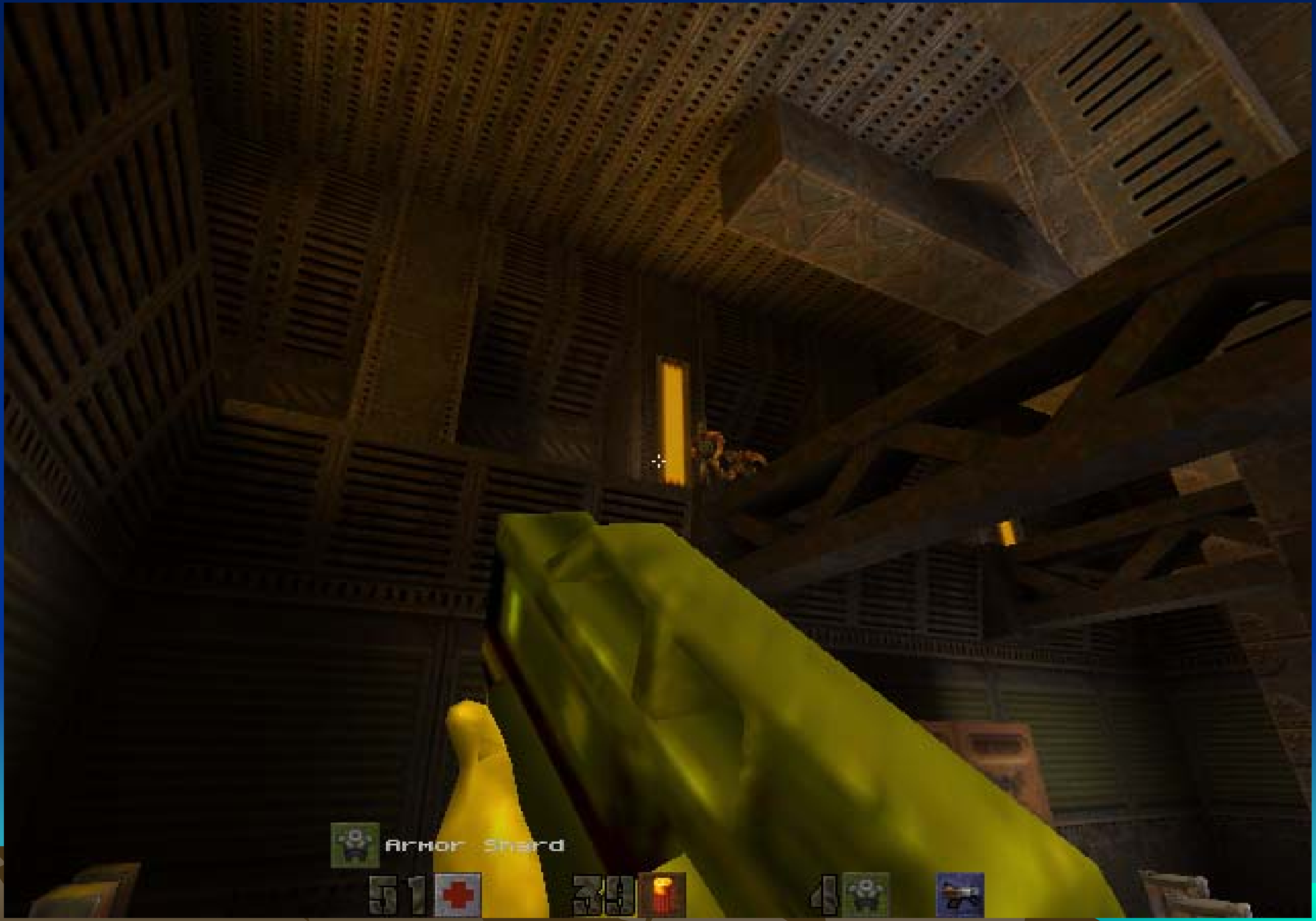


- Shows how FSM translates to non game aspects
- Pretty generic for all games
- Would be others, such as score, etc.
- FSMs hierarchical, break down finer
- Once mastered, allow visualization of complex game

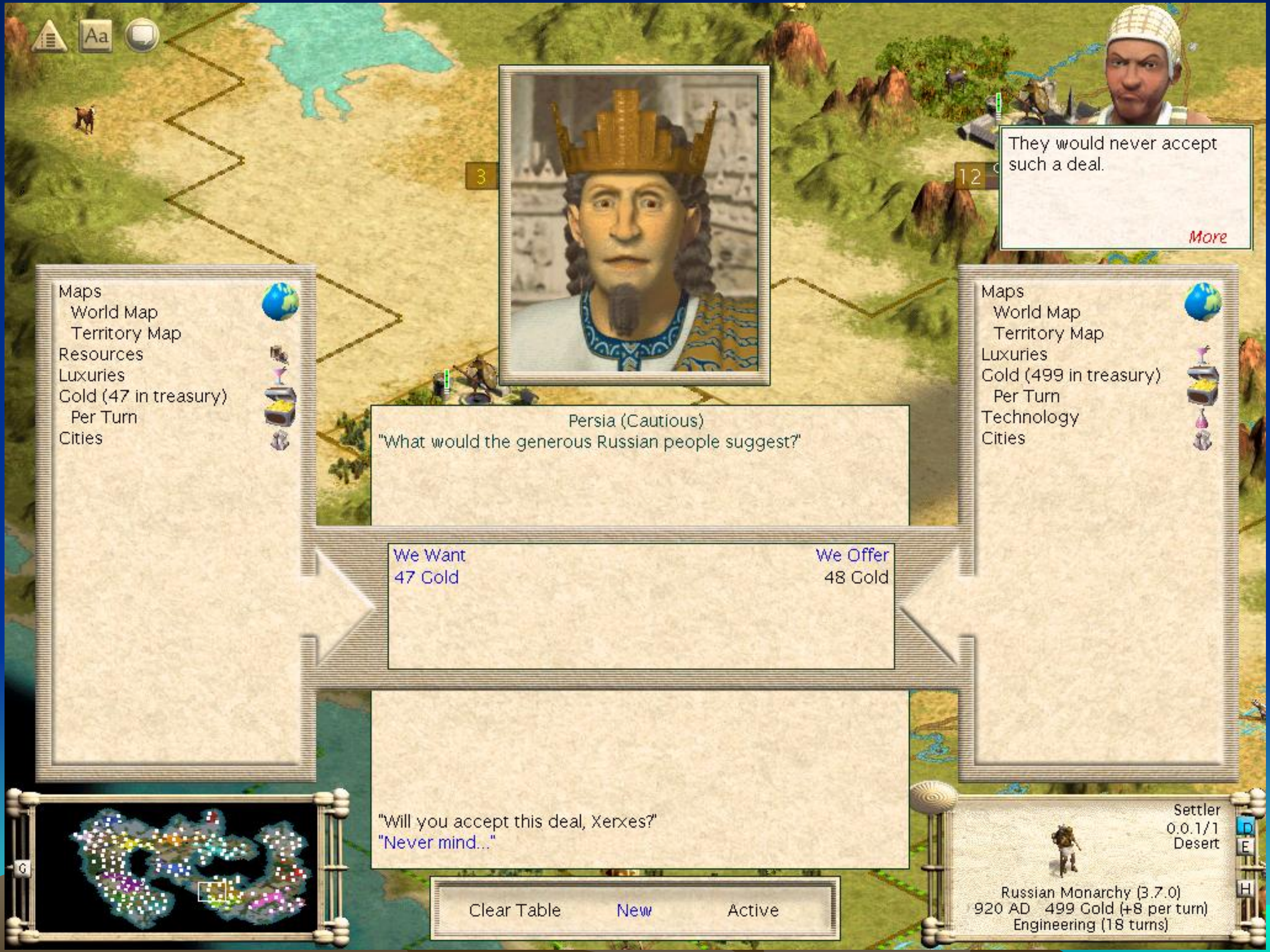
Kinds of architecture of game (engine)

- Oriented on animation
  - For action
  - For real strategy
  - For turn-based strategy
  - For quest
- Oriented on Intelligence
  - For board games
  - For casual games

Typical engine for action from Quake



Typical engine for turn-based strategy from Civilization



They would never accept such a deal.

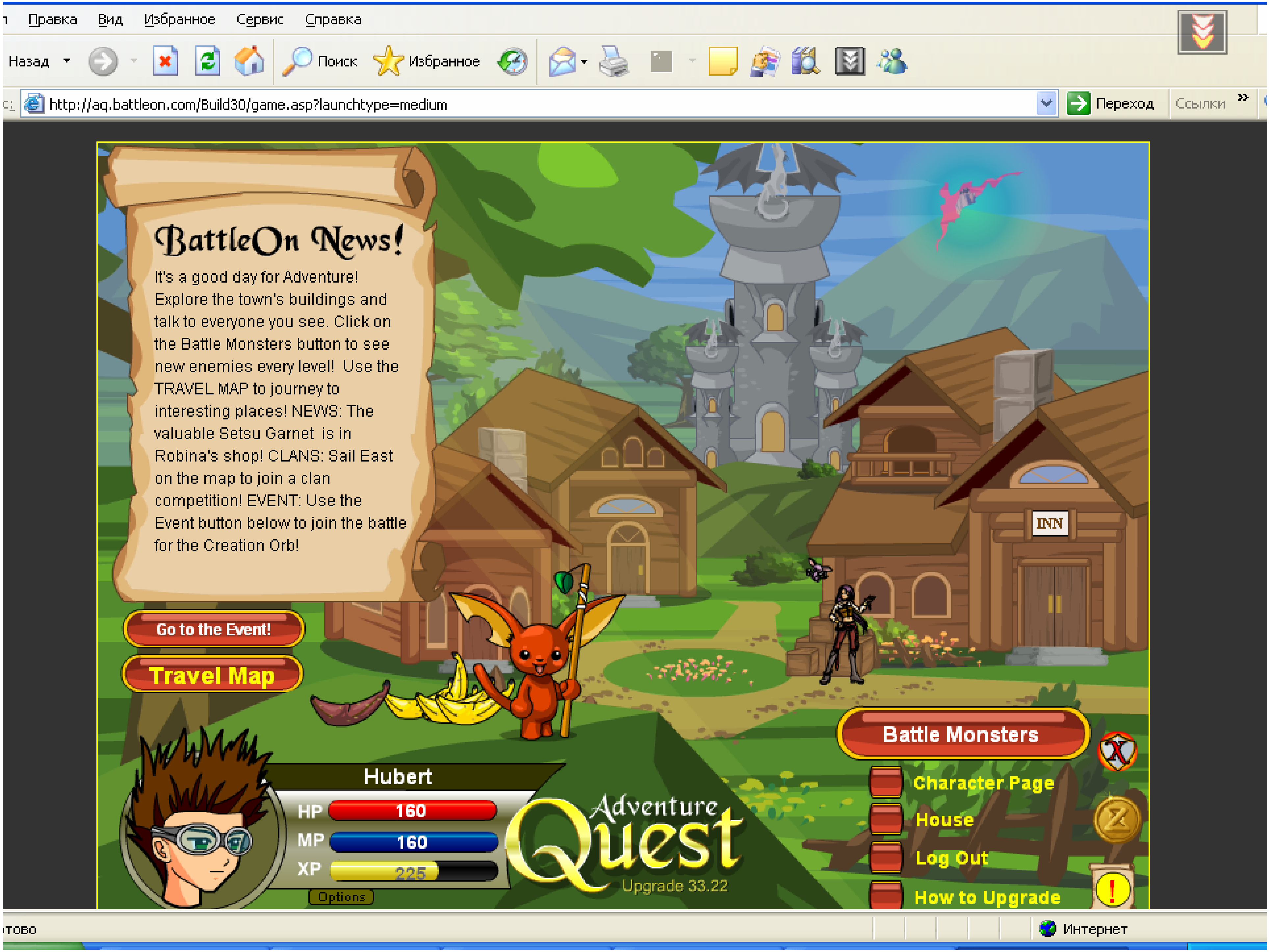
Persia (Cautious)
"What would the generous Russian people suggest?"

We Want	We Offer
47 Gold	48 Gold

"Will you accept this deal, Xerxes?"
"Never mind..."

Settler
0.0.1/1
Desert

Russian Monarchy (3.7.0)
920 AD 499 Gold (+8 per turn)
Engineering (18 turns)



http://aq.battleon.com/Build30/game.asp?launchtype=medium

BattleOn News!

It's a good day for Adventure! Explore the town's buildings and talk to everyone you see. Click on the Battle Monsters button to see new enemies every level! Use the TRAVEL MAP to journey to interesting places! NEWS: The valuable Setsu Garnet is in Robina's shop! CLANS: Sail East on the map to join a clan competition! EVENT: Use the Event button below to join the battle for the Creation Orb!

Hubert

HP 160

MP 160

XP 225