**Pacman Class Features** JonPawelko@yahoo.com

* Board
  + Dynamically build based on NUM\_COLUMNS and NUM\_ROWS variables.
  + Format board
  + Transition to Next Level board after eating all pellets and power pellets
  + Trap Door or Tunnel – Go into 1 hole, come out the other hole
* Pacman
  + Initial spawn – check for pellet or powerpellet
  + Respawn after level complete – move ghosts as necessary
  + Standard moving Pacman on an empty board
    - Direction icons
  + Eating good items
    - Pellets
    - Power Pellets
      * Different icon when Pacman is on PP power
    - Good Bombs
    - Fruit
    - Bonus Life
  + Dying from a ghost
    - Respawning after death
      * Delay respawn for a few seconds
      * Don’t respawn on a ghost, move ghost if nec
      * Don’t respawn on a power pellet or wall
    - Manage Lives
      * Out of lives = game over
  + Eating a ghost
* Walls
* Ghosts
  + Spawning
  + Moving
    - Special abilities
    - Move onto idle pacman – need to resolve as if Pacman moved onto ghost
  + Respawning after death – don’t respawn on a wall or within ~1 square of Pacman.
  + Respawn after level complete – don’t respawn on pacman or wall
* Good Items
  + Pellets
  + Power Pellets
    - Priority – Ghost or PP?
    - Don’t place in square 0 or wherever Pacman spawns to
    - Reverse chase
    - Update icon when timer ends
    - Delete old timer if new PP eaten
    - Delete old timer if level ends
  + Good Bombs
    - Collect
    - Implement
  + Fruit
* Bombs
  + Pacman drops bomb with space bar. Priority is showing Pacman over a bomb in a square.
  + In redrawboardpacman, check for bomb and draw bomb if nec.
* Stats section
  + Minimum – Score, Lives, Level.
  + Maybe – Bombs, other weapons
  + If room – Pellets eaten, ghosts eaten, ave ghost speed, other
* Music
* Increasingly difficulty – speed/intelligence of ghosts, reduction in power pellet time

**Competition Pacman Rules**

Competition – Second to last class – Tues Dec 10 – Sick date saved for final week.

# of lives = 3 or 5 – minimal extra life bonuses (1 max, relatively hard to earn)

Eat pellets, finish pellets, move to next board

Power pellets reverse chase

Arrow keys to move pacman

Stats section – Minimum – Score, Lives, Level. Maybe – Bombs, other weapons If room – Pellets eaten, ghosts eaten, other. Ave ghost speed.

Need at least minimal fruit rewards for points

Approved, fun music, plays on loop, nothing weird

Increasingly difficulty – speed/intelligence of ghosts, reduction in power pellet time

No cheat codes

All features need to be approved – no outside pacman experiences

Safe spawning between boards

Expected game duration 8 – 12 minutes

Board size – fit full screen - rectangular

Points – 4 winner, 2 second, 1 third (first and a third beats two seconds)

Tiebreaker is Jon’s game

Draft version locked 10 days before final game. Final version locked 5 days before final game.

Name your game, needs to have Pacman in it, kid-friendly

One page handout with rules, characters, etc… For audience during the match.

**Maintenance Fixes**

* Pacman spawns in square 0 surrounded by walls in a way where he can not escape without dying – ensure he can at least blast his way out.
  + Function changed – buildWallsAndPellets
* GHOST\_SPEED with randomizer not used for respawning ghosts \*
* Delay the respawning of ghosts for ~2 seconds – created function ghostRespawnTimer

**Good Bombs Design and Implementation**

* Treat good bombs like pellets and power pellets = 1 full array of 0 and 1 the length of all squares.
* To simplify design and implementation, only place a good bomb on a blank square or a square with a pellet (not a power pellet, not a wall).
* Priority Viewing:
  + Ghost – if a ghost goes over a good bomb square, show the ghost
  + Good Bomb
  + Pellet

**Code Areas Touched**

Global Variables:

* GOOD\_BOMB\_DELAY - how frequently all game good bombs are dropped in seconds (every 10 seconds)
* GOOD\_BOMB\_DURATION - how many seconds a good bomb exists before disappearing
* bombCount – total number of Pacman’s bombs. Start the game with a certain amount, but increase count by picking up good bombs.
* goodBombTimerID – needed to cancel the timer that drops good bombs
* cancelGoodBombTimerID – needed to cancel an individual good bomb
* ICON\_BOMB = "<img src='graphics/BombIcon1.jpg'>";
* ICON\_GOOD\_BOMB = "<img src='graphics/GoodBombIcon.jpg'>";
* goodBombs – array, similar structure to pellets, 0 or 1 whether a good bomb is in a square

Functions Changed:

* Renamed function to createPowerPelletsAndGoodBombs and added code to initialize the goodBombs array to all zeros.
* ResolvePacman function:
  + Always check after each arrow key for a good bomb by calling checkForGoodBomb() – check before checking for pellets.
* Create a new function called checkForGoodBomb()
* Create a new function called startGoodBombTimer() – call once at the start of the game
* Create a new function called function myGoodBombTimer() – grab the whole function
* Create a new function called cancelGoodBombTimer

Conditions Handled:

* Board finishes with a good bomb on the board
* Good bomb blows up multiple walls – check all 4 directions plus the direct square the bomb is in
* Ghost moving over good bomb

**Random Ghost Tick Timing Design and Implementation**

* Instead of starting all ghosts on the exact timing pattern, add or subtract a small amount of time for each ghost’s tick.

Functions Changed:

* spawnGhost – see new variable ghostRandomizer

**Tunnel Feature Design and Implementation**

* A Tunnel is a square on the board that is the entry to an “underground” tunnel.
* Pacman or a ghost enters the tunnel and exits the other side on the other tunnel square.
* Pacman exits the tunnel facing the same direction that he went in and waits on the tunnel space for a move.
* If Pacman is waiting in a tunnel space, ghost should be able to kill him (Ghost check for Pacman before checking for tunnel).
* Tunnel can have diff status (optional):
  + Open to all – minimum requirement
  + Closed to all
  + Closed to Pacman
  + Closed to ghosts
* Can’t drop a bomb on a tunnel square – added a check to resolvePacMan when space bar pressed
* Don’t drop a good bomb on a tunnel square – added a check to myGoodBombTimer

Global Variables:

* tunnel1num – square number of the tunnel hole in board, exit other tunnel
* tunnel2 num;
* ICON\_TUNNEL – const for tunnel icon
* TUNNEL1\_SQUARE\_NUM
* TUNNEL2\_SQUARE\_NUM

Functions Changed:

* Created new function createTunnel()
* “Driver” function – call createTunnel after all pellets and walls
* drawInitialBoard now checks last for a tunnel in a square
* created new function processPacmanTunnel – changes current if Pacman is on a tunnel square
* resolvePacman – added a call to processPacmanTunnel() in each arrow key before checking for anything else
* updated redrawBoardPacman
* created processGhostTunnel function – simply checks if ghost on a tunnel, if yes, update it’s square num.
* updated resolveGhost to call processGhostTunnel for each direction arrow after checking if on pacman
* updated redrawBoardGhost to check for tunnel in old square

**Ghost Smarts Feature Design and Implementation**

This feature controls how “smart” the ghosts are by having a higher % chance of moving towards pacman on each ghost tick.

Global Variables:

GHOST\_SMARTS – a number representing the % of time (out of a 100) that a ghost will move in the “right” direction.

Functions Changed:

* create new function calcGhostDirection – determines the direction of pacman in relation to the ghost. 8 possible directions… E, NE, N, NW, W, SW, S, SE. Then uses randomizer and GHOST\_SMARTS to calculate the next direction to go.
* For example, if GHOST\_SMARTS is 60%, 60% of the time it will go towards pacman in regular mode and 40% of the time it will go randomly in 1 of the other 3 directions.
* ghostTick – change the code that sets the possible direction. Call calcGhostDirection instead of calculating it here. Return is still the same 4 possible directions.

**Rabid Ghost Feature Design and Implementation**

This feature is a new ghost type that chases Pacman, even when Pacman is in PowerPellet mode.

As of now, that is the only change from a regular ghost… If a ghost’s “right” decision is to run away from pacman when on PP mode, then the Rabid ghost will instead run towards pacman in this situation.

As part of this change, a better approach to ghosts has been implemented. At the end of each level, the ghosts array will be rebuilt to minimize potential long term play “memory leak”

Global Variables:

GHOST\_TYPE\_NORMAL

GHOST\_TYPE\_RABID

numGhosts – starting number of ghosts on each level

Functions Changed:

calcGhostDirection

* Ghost Respawning – Post Rabid Ghost addition – When a ghost is killed, he should be respawned with the same type.
  + Update

**Game Over Feature**

Instead of an alert window, stop all game action and show a message near the board Game Over.

document.getElementById("GameOverMessage").innerHTML = "Game Over!";

Functions Changed:

Killpacman – loop through all timers and clear them, put message near the board… Game Over.

**Pacman Brainstorm Ideas**

* Sound effects
  + Power Pellet status on, off
  + Eat ghost
  + Pacman killed
  + Bomb explodes
  + Special items
* Weapons or Pacman Helpers:
  + Nukes – Blasts all ghosts off board, 1 extra ghost spawned. Extra ghost should be permanent or might be too easy to save towards end of board.
  + Blaster – blasts a ray or laser in a straight direction in the direction pacman is going. Kills all ghosts.
  + Shield – Pacman is immune, but kills no ghosts, eats no PP. Can be used if Pacman is desperate to clear an area of pellets. Just run crazy over field.
  + Extra Life – Different possibilities
    - After eating X ghosts – Incentivizes aggressive ghost eating.
    - After X levels – Incentivizes leveling, not ghost eating
    - After collecting X items
  + Tunnel Wizard – Allows Pacman to manage tunnels for a while
    - Shut off tunnel to ghosts
    - Make tunnel 1 way only
    - Pacman can hide in tunnel for X seconds
* Ghost Core Characteristics:
  + Randomize Ghost Smarts – all shouldn’t be exactly 70%
  + Ghost Faster – Each level ghosts should increase in speed between 3 – 6% (like blinds going up in poker). Potentially ghosts should get faster within 1 level if pacman is stalling.
* Ghost Types (Special Abilities)
  + Any from previous pacman game
  + Mole – Cast a spell to activate the Mole Ghost. Mole Ghost turns on other ghosts and kills them if they touch. Either automatically available or pacman needs to pick up the spell. Likely single use. Other ghosts drawn to mole.
  + Tunnel Blaster – Periodically gets angry and blows up the tunnel. Better eat a PP and eat this ghost beforehand.
  + Wall builder – Periodically builds walls to make it harder for pacman, possibly builds a wall over a pellet, requiring pacman to blast it free.
  + Saboteur – Sabotages a square by leaving poison in it that kills pacman if he touches it. Poison could possibly fade. Possible antidote to get rid of poison.
  + Sensei – Every time another ghost touches this ghost, they get smarter and faster.
  + Cloner – Clones itself if Pacman eats it (comes back as 2). Clone once or infinite?
  + Ziggy – Only goes diagonal

**Adding the Poison Ghost Instructions**

* Add a new constant in the list of Ghost type constants
* Add a new constant in the list of Ghost icon constants – new file name
* Add a new constant for the poison icon – new file name
* Add a new constant for the poison percentage
* Create new global array poison – similar to bombs and pellets, 0 or 1 if poison in a space
* Created / Update getGhostIcon function
* Created checkForPoison helper function
* Updated processGhostTunnel to return true or false if on tunnel, only do ghost feature if NOT on a tunnel.
* Updated reSpawnGhost and spawnGhost to randomly create poison ghosts
* Updated resolveGhost to use oldSquare to drop poison – calls processPoison
* Create a timer function to turn off the poison – myPoisonTimer
* Create a function to determine whether to drop poison and update all data structures if poison dropped – processPoison
* Updated redrawBoardGhost to check for poison and draw as nec
* Clear the timer in resetboard - Updated clearGhostTimers to delete all timers for a ghost
* Updated getGhostIcon
* Updated killPacman to reset pacman icon to regular mode and reset game status.
* Don’t drop a good bomb on poison – Updated myGoodBombTimer
* Changed function createPowerPelletsAndGoodBombs to createItems

**Wall Builder Ghost Design and Implementation**

* On ghost tick, wall builder determines whether it moves or starts building a wall. If start building a wall, don’t move for X seconds while building, when done a wall appears in an adjacent cell and the ghost continues moving.
* Needs new Ghost Type = Wall Builder – Unique data types:
  + Timer function id -

Jon Pacman Competition Updates

Points

* 10 points per ghost
* 1 point per power pellet
* 1 point per pellet
* 0 points for picking up a good bomb or bombing a wall
* Free life at 500 – Expected towards end of first level or early second
* 100 points per live not used at end of 10 minutes

Timer

* Starts with 10 mins, stops game at 0. Sort of an ungraceful stop, need to still kill good bombs. Pac man and ghosts stopped at 0.
* gameStatus variable created to track whether game is on or not. Timer flips this at the end. Other components check this flag before doing anything.

Ghosts

* Implemented 6% increase in average speed per level
* Now show Ave speed on scoreboard, lower number = faster

Sound

* Eating ghost sound added

Bugs

* Wall there, but not drawn – Wall checker that runs every second and checks walls array vs. html in the square. Corrects if necessary.

Questions