Contents


```
%Stores constant values that need to be accessed from many locations. This
%allows us to not need to pass each of these into each function, or worse,
%hard-code them. Most functions reference this when a value that doesn't change
%is needed.
classdef Const
    properties (Constant)
```

DEBUG

```
        %For making stuff make sense.
        debugTextX = 100;
        debugTextY = 100;

        debugShowRocketPos = 0; %shows rocket position
        debugShowCowPos = 0; %show cow position
        debugShowGameState = 0; %show game state

        debugForceSpawnCow = 0; %Debug key forces a cow to spawn

        debugBlueScreenBG = 0; %bluescreen background for easier graphics
        debugHideUI = 0; %hide the UI (gauges, altimeter, score). Does not apply when paused.
```

DISPLAY CONSTANTS

```
        %Scale values should not be changed from 1, as it has a significant
        %performance impact.
        blueScreenBGImg = 'Assets/backgroundBlueScreen.png'; %bluescreen image
        backgroundImg = 'Assets/background.png'; %Path to the background image
        backgroundScale = 1; %Do not change scale values.

        rocketImg = 'Assets/rocket3.png'; %Path to the rocket image
        rocketScale = 1; %Do not change scale values.

        crashedRocketImg = 'Assets/rocket3_crashed.png'; %Crashed version of the rocket

        %Low/mid/high thrust images (with flames)
        rocketThrust1Img = 'Assets/rocket3_low.png';
        rocketThrust2Img = 'Assets/rocket3_mid.png';
        rocketThrust3Img = 'Assets/rocket3_high.png';

        exhaustImg = 'Assets/exhaust.png'; %exhaust particle
        dirtImg = 'Assets/dirt.png'; %dirt particles
        particleScale = 5; %Scale for the particles

        cowImg = 'Assets/cow.png'; %Path to the cow image
        cowScale = 1; %Do not change scale values.
        noneImg = 'Assets/noneImg.png'; %1x1 transparent png.
```

```
cowFlyImg = 'Assets/cowFly.png'; %flying cow image

foregroundDepth = 5; %The rocket and cows appear on this depth.
titleScreenImg = 'Assets/titleScreen.png'; %Title screen
pauseScreenImg = 'Assets/pauseScreen.png'; %Pause screen
crashScreenImg = 'Assets/crashScreen.png'; %Crash screen

crashedTractorImg = 'Assets/crashedTractor.png' %Crashed tractor obstacle

tutorial1Img = 'Assets/tutorial.png'; %Tutorial screen

windowSize = [1280 720]; %Window size, pixels.

%This controls how fast things appear to move (how far a sprite is
%moved when its position changes by one meter)
pixelsPerMeter = Const.windowSize(1) * 50/1280;

zeroAlt = 80 - 0.5 * Const.pixelsPerMeter; %pixels

backgroundVerticalScroll = 0; %Whether or not to scroll the backround up and down
```

FUEL GAUGE CONSTANTS

```
fuelGaugeWidth = Const.windowSize(1) * 50/1280
fuelGaugeMaxHeight = Const.windowSize(2) / 2;
fuelGaugeOffset = [ 50/1280 * Const.windowSize(2), Const.windowSize(2) / 5];

%X and Y coordinates of the fuel gauge's text label
fuelTextX = Const.fuelGaugeOffset(1) + Const.fuelGaugeWidth/5;
fuelTextY = Const.fuelGaugeOffset(2) + Const.fuelGaugeMaxHeight + Const.windowSize(2)/40;

%Colors for the fuel gauge
fuelGaugeFillColor = [1, .5, 0];
fuelGaugeEdgeColor = [0, 0, 0];
fuelGaugeLineWidth = 3;

altTextX = Const.windowSize(1)/2 - 60 %altitude text x coord
altTextY = Const.windowSize(2) - 40; %altitude text y coord

scoreTextX = Const.windowSize(1) - 300; %Score text x coord
scoreTextY = Const.windowSize(2) - 40; %Score text y coord

%Throttle gauge constants
%How far off the bottom of the screen the throttle gauge is
throtGaugeOffsetY = Const.windowSize(2) / 30;
throtGaugeHeight = Const.windowSize(2) * 20/720;
%How wide the throttle gauge is
throtGaugeWidth = Const.windowSize(1) / 2;
%Left side of the throttle gauge
throtGaugeLeftX = Const.windowSize(1)/2 - Const.throtGaugeWidth/2;
%Right side of the throttle gauge
throtGaugeRightX = Const.windowSize(1)/2 + Const.throtGaugeWidth/2;

%Throttle gauge Position vector
throtGaugeRectPos = [Const.throtGaugeLeftX, Const.throtGaugeOffsetY,...
    Const.throtGaugeWidth, Const.throtGaugeHeight];

%Colors of the throttle gauge
throtGaugeFillColor = [1, 0, 0];
throtGaugeEdgeColor = [0, 0, 0];
throtGaugeLineWidth = 3;

throtTextMargin = Const.windowSize(2) * 10/720
throtTextX = Const.throtGaugeRightX + Const.throtTextMargin;
throtTextY = Const.throtGaugeOffsetY + Const.throtGaugeHeight / 2;
```

ROCKET CONSTANTS

```
gravity = -9.806; %gravity, meters per second squared
dryMass = 100000; %dry mass, kilograms
fuelRate = 5000; %propellant burned per second at maximum throttle, kilograms per second
maxThrust = 5000000; %maximum thrust, newtons
maxPropMass = 360000; %maximum propellant mass, kilograms
frictionMultiplier = 0.99; %velocity is multiplied by this each frame to approximate friction
frameTime = 1 / 60; %seconds

%Whether to use the W and S keys for incremental throttle.
%Gameplay is more fun without them! Also, MATLAB has issues
%handling multiple keypresses at once. Using the Z and X keys
%exclusively means that you have instant control of throttle,
%whereas W and S would drop inputs if you were also changing angle.
incThrottle = 0;

%Whether to animate the flame. Uses the different throttle images
%as animation rather than for different throttle levels.
flameAnim = 1;

%Frames between switching flame images if flame anim is used.
flameAnimTime = 5;

%Throttle cutoffs: Below these values, the rocket will appear to
%have a different size of flame (if it has propellant).
throttle2cutoff = 0.8; %Mid throttle
throttle1cutoff = 0.5; %Low throttle
throttle0cutoff = 0.1; %Zero throttle

%Altitude above the zero altitude at which the rocket crashes. This
%is needed because the zero altitude is lower than the ground
%appears (to facilitate the cows and tractors spawning in the
%correct place)
crashAlt = Const.zeroAlt + 0.3 * Const.pixelsPerMeter; %meters
crashSpeed = 3; %meters per second. Below this will not crash.
```

STARTING CONSTANTS

```
startingAngle = 0; %default angle, degrees
startingPropMass = 360000; %default prop mass, kilograms
%startingPropMass = 50000; %for testing low fuel behavior
%This is the middle of the screen by default, but could be changed
%if you wanted.
startingPosition = Const.windowSize/2; %default position, m
startingVelocity = [0,0]; %default velocity, m/s
startingAltitude = 5; %default altitude, meters
%Start at full throttle so that we don't dump the player into the
%ground and crash instantly.
startingThrottle = 1; %default throttle, 0 to 1
startingGameState = "title"; %title screen
restartGameState = "title"; %game state if restarting from crash
```

COW CONSTANTS

```
cowPropMass = 30000; %mass of propellant given by cow, kilograms
cowRandVals = [10, 60]; %minimum and maximum distance to next cow, meters
propCowPity = 0.1; %value of the maximum fuel at which cow is force spawned
cowSpawnMargin = 100; %distance from edge the cow should spawn, pixels

%This value is negative because the cow needs to appear like its
%feet are on the ground. If it were zero, the cow looks like it's
%floating.
cowSpawnAlt = 0; %Altitude over the ground to spawn the cow, meters
```

```
        tractorSpawnAlt = 1; %Altitude over the ground for when the cow is a tractor.
        cowKillMargin = 400; %distance outside of the screen at which the cow should be set to invisible and intangible
        cowFlyChance = 0.2; %chance for the cow to be flying. 0.2 = 20%

        tractorChance = 0.1; %Chance of being evil and spawning a tractor instead of a cow
        tractorScale = 1; %tractor's display scale

        cowFlyRandAlts = [2, 10]; %random altitudes for flying cows to spawn!
        cowFlyPropMass = 45000; %mass of propellant for flying cows, kg

        %cowSpawnY = 0; %spawn y in pixels for old spawn behavior. no longer used
```

PARTICLE CONSTANTS

```
        numParticles = 20; %Maximum number of particles
        defaultParticlePos = [0,0]; %Default particle position when not in use

        particleSpawnTime = 5; %frames, time between spawning new particles.

        particleMaxAge = 180; %frames
        %When a particle is despawned, its age is set to a very high
        %number. This way, when looking for a slot to spawn a new particle
        %in, this particle will be selected.
        particleDespawnedAge = 9999; %Indicates a particle as despawned.

        %Distance to offset the particle spawns from the rocket's location
        particleOffsetDistance = -100; %pixels

        %Starting velocity when at max throttle
        particleMaxVelocity = 8; %meters per second

        particleAngleSpread = 20; %degrees, spread in angle when exiting the engine
        particleGravity = -3; %meters per second, gravity for particles
        particleScaleInc = 0.05; %Increase in particle size per frame
        %Particle drag
        particleAirDrag = 0.9; %Drag multiplier applied every frame.
        %Ground drag here has little basis in physics, but hopefully makes
        %the exhaust behave in a more interesting way. The velocity is
        %multiplied by element by this vector, so the ground reduces the
        %vertical velocity more than the horizontal velocity. Only applied
        %on a frame when the particle goes into the ground.
        particleGroundDrag = [1, 0.2];
```

SCORING CONSTANTS

```
        altitudeScoreCutoff = 5; %If below this altitude, score is counted
        angleMultiplier = 1; %Multiplier for angle scoring
        altitudeMultiplier = 1; %Multiplier for altitude scoring
```

CONTROL CONSTANTS

```
        throttleInc = 1; %per second. 1 means that it goes from zero to full throttle within one second.
        rotationInc = 180; %degrees per second
```

```
    end
end
```

```
ans =

  Const with properties:
```

```
              debugTextX: 100
              debugTextY: 100
       debugShowRocketPos: 0
          debugShowCowPos: 0
       debugShowGameState: 0
       debugForceSpawnCow: 0
        debugBlueScreenBG: 0
              debugHideUI: 0
          blueScreenBGImg: 'Assets/backgroundBlueScreen.png'
            backgroundImg: 'Assets/background.png'
          backgroundScale: 1
                rocketImg: 'Assets/rocket3.png'
              rocketScale: 1
        crashedRocketImg: 'Assets/rocket3_crashed.png'
        rocketThrust1Img: 'Assets/rocket3_low.png'
        rocketThrust2Img: 'Assets/rocket3_mid.png'
        rocketThrust3Img: 'Assets/rocket3_high.png'
              exhaustImg: 'Assets/exhaust.png'
                 dirtImg: 'Assets/dirt.png'
             particleScale: 5
                   cowImg: 'Assets/cow.png'
                 cowScale: 1
                  noneImg: 'Assets/noneImg.png'
                cowFlyImg: 'Assets/cowFly.png'
          foregroundDepth: 5
           titleScreenImg: 'Assets/titleScreen.png'
           pauseScreenImg: 'Assets/pauseScreen.png'
           crashScreenImg: 'Assets/crashScreen.png'
        crashedTractorImg: 'Assets/crashedTractor.png'
             tutorial1Img: 'Assets/tutorial.png'
               windowSize: [1280 720]
            pixelsPerMeter: 50
                   zeroAlt: 55
backgroundVerticalScroll: 0
            fuelGaugeWidth: 50
       fuelGaugeMaxHeight: 360
          fuelGaugeOffset: [28.1250 144]
                fuelTextX: 38.1250
                fuelTextY: 522
       fuelGaugeFillColor: [1 0.5000 0]
       fuelGaugeEdgeColor: [0 0 0]
       fuelGaugeLineWidth: 3
                  altTextX: 580
                  altTextY: 680
                scoreTextX: 980
                scoreTextY: 680
        throtGaugeOffsetY: 24
         throtGaugeHeight: 20
          throtGaugeWidth: 640
          throtGaugeLeftX: 320
         throtGaugeRightX: 960
        throtGaugeRectPos: [320 24 640 20]
      throtGaugeFillColor: [1 0 0]
      throtGaugeEdgeColor: [0 0 0]
      throtGaugeLineWidth: 3
          throtTextMargin: 10
               throtTextX: 970
               throtTextY: 34
                  gravity: -9.8060
                  dryMass: 100000
                 fuelRate: 5000
                maxThrust: 5000000
              maxPropMass: 360000
        frictionMultiplier: 0.9900
                 frameTime: 0.0167
              incThrottle: 0
```

```
              flameAnim: 1
          flameAnimTime: 5
       throttle2cutoff: 0.8000
       throttle1cutoff: 0.5000
       throttle0cutoff: 0.1000
              crashAlt: 70
           crashSpeed: 3
         startingAngle: 0
      startingPropMass: 360000
      startingPosition: [640 360]
      startingVelocity: [0 0]
      startingAltitude: 5
      startingThrottle: 1
     startingGameState: "title"
      restartGameState: "title"
           cowPropMass: 30000
           cowRandVals: [10 60]
           propCowPity: 0.1000
        cowSpawnMargin: 100
           cowSpawnAlt: 0
       tractorSpawnAlt: 1
         cowKillMargin: 400
          cowFlyChance: 0.2000
         tractorChance: 0.1000
          tractorScale: 1
        cowFlyRandAlts: [2 10]
        cowFlyPropMass: 45000
          numParticles: 20
    defaultParticlePos: [0 0]
     particleSpawnTime: 5
        particleMaxAge: 180
  particleDespawnedAge: 9999
particleOffsetDistance: -100
   particleMaxVelocity: 8
   particleAngleSpread: 20
       particleGravity: -3
      particleScaleInc: 0.0500
       particleAirDrag: 0.9000
    particleGroundDrag: [1 0.2000]
   altitudeScoreCutoff: 5
       angleMultiplier: 1
    altitudeMultiplier: 1
           throttleInc: 1
           rotationInc: 180
```

Published with MATLAB® R2021b