

The background features a white triangle pointing downwards, centered on a white background. The triangle is surrounded by abstract, overlapping geometric shapes in various shades of green, ranging from light lime to dark forest green. These shapes have a fine, grid-like texture. The overall composition is clean and modern.

Space Explorer

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Goal

- ▶ virtual environment to simulate the exploration of our solar system
- ▶ 3 Modules
 - ▶ ISS Internal Exploration
 - ▶ ISS External Space Walk
 - ▶ Solar System Exploration

Objectives

- ▶ navigate a space craft through the solar system,
- ▶ move around inside the space craft, and complete simple task
- ▶ leave the spacecraft to conduct a space walk



Modeling

- ▶ Downloaded multiple 3d Models with Texture from NASA web site
- ▶ Some challenges encountered when importing downloaded models
 - ▶ Importing Texture were not consistent
 - ▶ Some models were too big to be incorporated to the main scene

Vision

- ▶ Planets

- ▶ Modeled from scratch

- ▶ Used spheres and textures to build planet models

- ▶ Star Maps

- ▶ Created environment map textures to be used in the scene using graphic tools



User Interaction

- ▶ Menus are used to switch from one module to another
- ▶ Keyboard keys were used to control avatars
- ▶ Mouse gestures were used to change view point in some module

Sensors

- ▶ Proximity sensors were used to detect proxy events between sensors and targets

Animations

- ▶ Animations were used to simulate solar particles
- ▶ Animations were used for movement of planets
- ▶ Animations were used to simulate solar wave/radiations

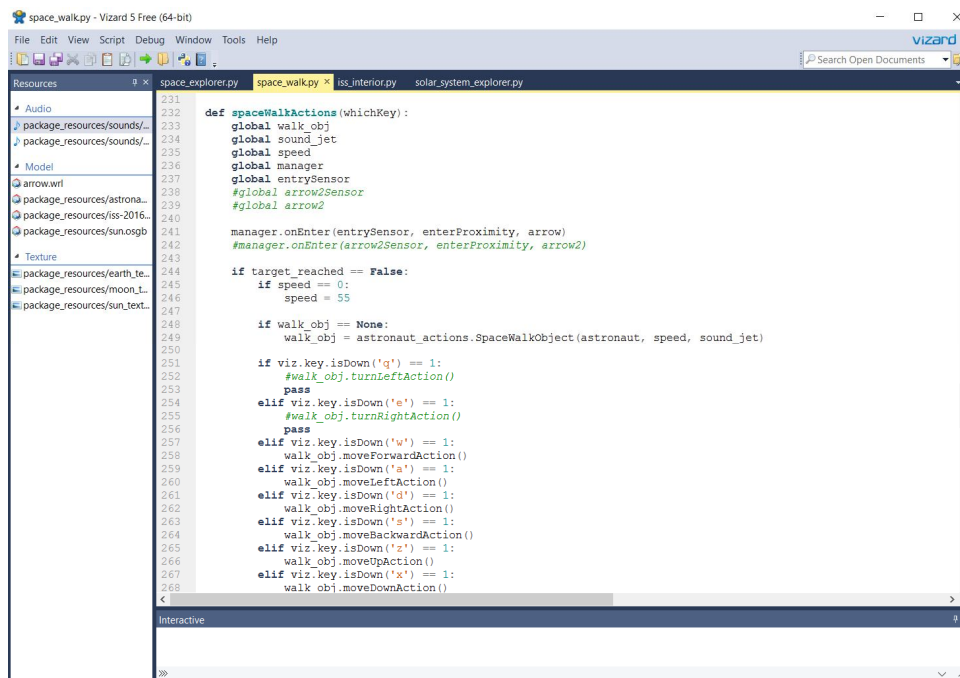


Space Walk Module - Key features

1) The user can control the astronaut using various keyboard keys. The key map of the module is as the following:

Key	Action	Description
'9'	Camera Zoom out	Main view is zoomed out exposing astronaut's back side
'0'	Camera Zoom in	Main view is zoomed in as 1 st person view
'w'	Move Forward	Astronaut moves forward
's'	Move Backward	Astronaut moves backward
'a'	Move Left	Astronaut moves left
'd'	Move Right	Astronaut moves right
'z'	Move Up	Astronaut moves up
'x'	Move Down	Astronaut moves down
'left arrow'	Yaw Left	Astronaut yaw left
'right arrow'	Yaw Right	Astronaut yaw right
'up arrow'	Pitch Up	Astronaut pitch up
'down arrow'	Pitch Down	Astronaut pitch down
'left ctl'	Roll Left	Astronaut roll left
'left alt'	Roll Right	Astronaut roll right
'pad -'	Speed down by 10	Astronaut's movement speed is up by 10 unit
'pad +'	Speed up by 10	Astronaut's movement speed is down by 10 unit
'p'	Pause Astronaut actions	Astronaut's actions are paused
'o'	Resume Astronaut actions	Astronaut's actions are resumed

Space Walk Module - Key features -IDE



The image shows a screenshot of the Vizard IDE interface. The main window displays the Python code for the Space Walk Module. The code defines a function `spaceWalkActions` which handles various key presses to control a space walk object. The code includes global variables for `walk_obj`, `sound_jet`, and `speed`, and a `manager` object. It uses `onEnter` events to trigger actions when a target is reached. The code is as follows:

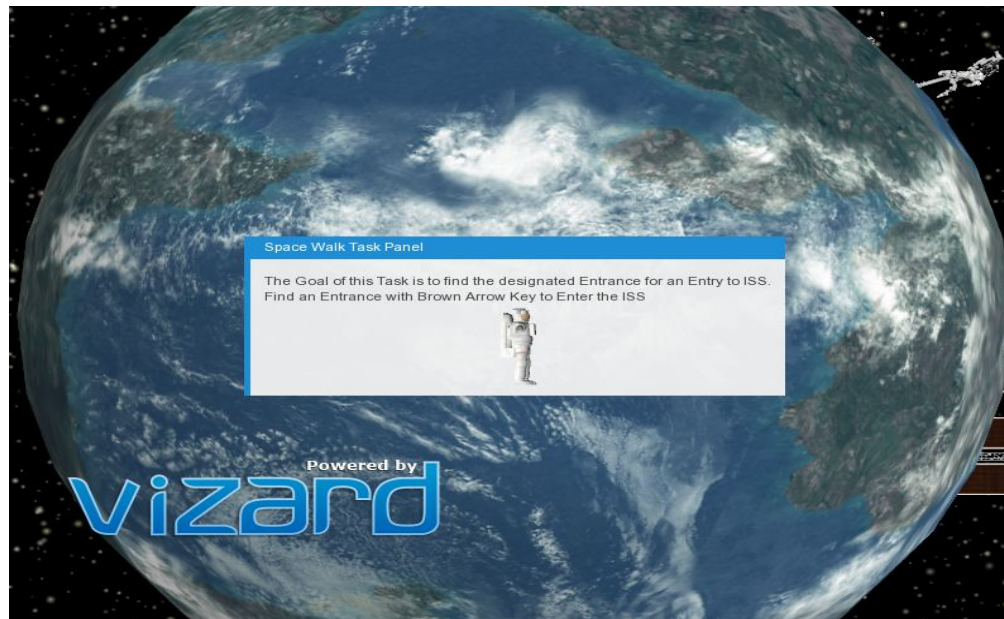
```
231
232
233 def spaceWalkActions(whichKey):
234     global walk_obj
235     global sound_jet
236     global speed
237     global manager
238     global entrySensor
239     #global arrow2Sensor
240     #global arrow2
241     manager.onEnter(entrySensor, enterProximity, arrow)
242     #manager.onEnter(arrow2Sensor, enterProximity, arrow2)
243
244     if target_reached == False:
245         if speed == 0:
246             speed = 55
247
248         if walk_obj == None:
249             walk_obj = astronaut_actions.SpaceWalkObject(astronaut, speed, sound_jet)
250
251         if viz.key.isDown('q') == 1:
252             #walk_obj.turnLeftAction()
253             pass
254         elif viz.key.isDown('e') == 1:
255             #walk_obj.turnRightAction()
256             pass
257         elif viz.key.isDown('w') == 1:
258             walk_obj.moveForwardAction()
259         elif viz.key.isDown('s') == 1:
260             walk_obj.moveLeftAction()
261         elif viz.key.isDown('d') == 1:
262             walk_obj.moveRightAction()
263         elif viz.key.isDown('z') == 1:
264             walk_obj.moveBackwardAction()
265         elif viz.key.isDown('x') == 1:
266             walk_obj.moveUpAction()
267         elif viz.key.isDown('v') == 1:
268             walk_obj.moveDownAction()
```

Space Walk Module - Key features

- 2) Beautiful background music is played while the user is experiencing the simulation
- 3) When movement keys are pressed, sound of air jet simulated sound is played

Space Walk Module - Key features

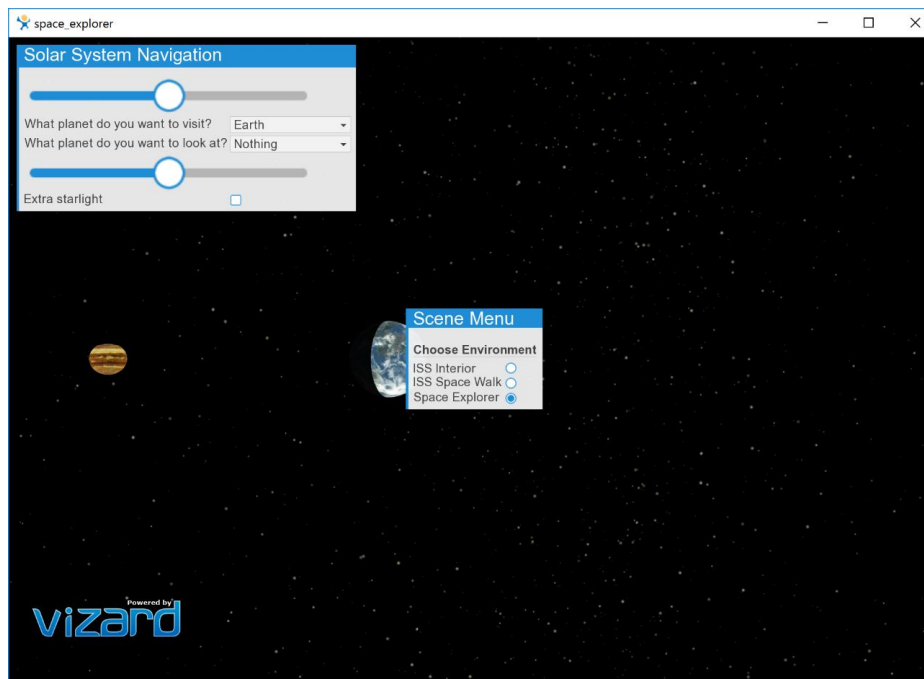
4) A task is given to find an entry point to the internal of ISS. It is marked with yellow down arrow key.



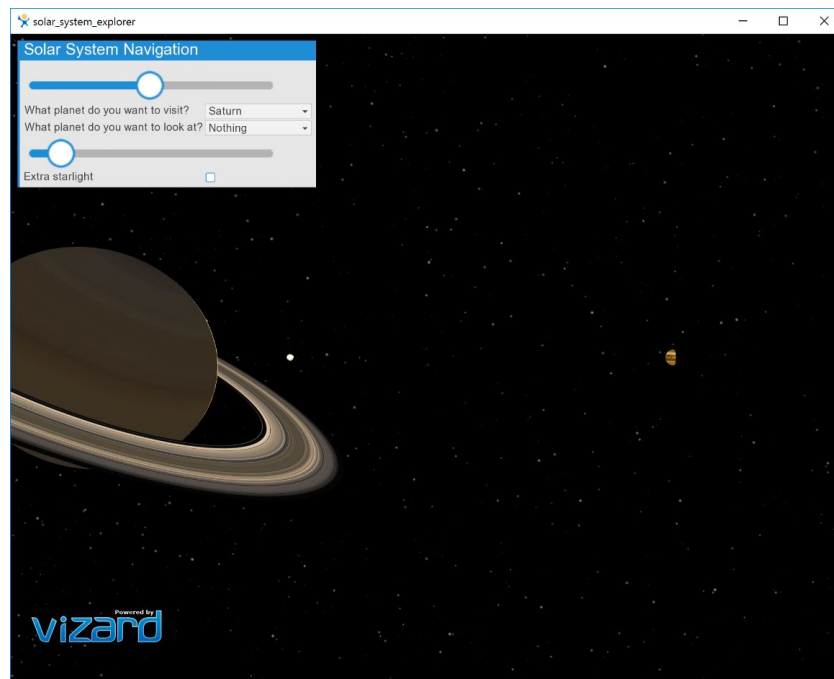
Solar System Exploration

- ▶ Purpose: Explore different planet system within our solar system
- ▶ Key Features:
 - ▶ Users can navigate to different planet using the menu system
 - ▶ Users can view different planet regardless of their location
 - ▶ Simulate solar particles
 - ▶ Simulate movement of planets

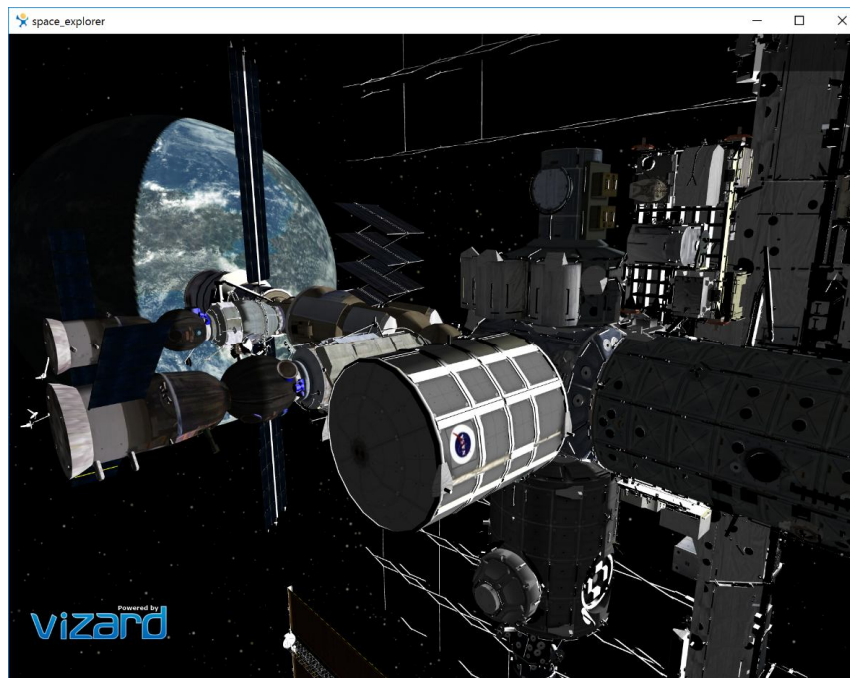
Solar System Exploration – screen captures



Solar System Exploration – screen captures



Solar System Exploration - screen captures



Solar System Exploration – screen captures

```
solar_system_explorer.py - Vizard 5 Free (64-bit)
File Edit View Script Debug Window Tools Help
vizard
Search Open Documents

Code Browser
iss_interior.py space_explorer.py space_walk.py solar_system_ex... bct_common.py space_walk_sim...

** solar_system_explorer
* start_vizard
* update_views
* animate_view
* attach_view
* change_look_at
* change_orbit_radius
* load_navigation_panel
* show_navigation_panel
* make_view_look_at_target
* make_view_orbit_target
* setup_solar_system
* init_module
* start_module
* stop_module

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name = 'The Sun'
sun = solar_system.add(name,
    orbit_center=[0, 0, 50],
    revolution_period=100,
    size=633.0,
    color=[255, 255, 192],
    illuminate=True,
    spin_period=500)
bct_common.scale_size(sun, 1.0 / 40.0)
make_view_look_at_target(name)

name = 'Mercury'
mercury = solar_system.add(name,
    texture_path='package_resources/Mercury_Map.jpg',
    size=2.2,
    tilt=[0, 1, 0],
    orbit_target=sun,
    orbit_major_axis=58.0,
    orbit_minor_axis=50.0,
    orbit_u_axis=[2, 0, -1],
    revolution_period=50,
    spin_period=-176)
bct_common.scale_orbit(mercury, orbit_scale_factor)
bct_common.scale_size(mercury, size_scale_factor)
make_view_orbit_target(name)
make_view_look_at_target(name)

Interactive
** ERROR: Failed to load texture: '
Loading File: package_resources/iss/ISS Interior USOnly_TexturesPacked.dae
Failed to find matching <bind vertex input> for UVMap
Failed to locate <instance material> with symbol
Failed to find matching <bind vertex input> for UV
Failed to find matching <bind vertex input> for UV
Failed to locate <instance material> with symbol
Loading File: duck.cfg
Loading File: package_resources/iss-2016/ISS_2016.dae

Code Browser Resources
Interactive Task List (0) Find Results
Save the active document
setup_solar_system Ln 197 Col 1 INS
```

ISS Interior Exploration

- ▶ Purpose: Allows users to navigate within the ISS.
- ▶ Key features:
 - ▶ User task to locate ducks within ISS environment given predefined time limits
 - ▶ Keyboard and mouse keys and gestures were utilized to navigate

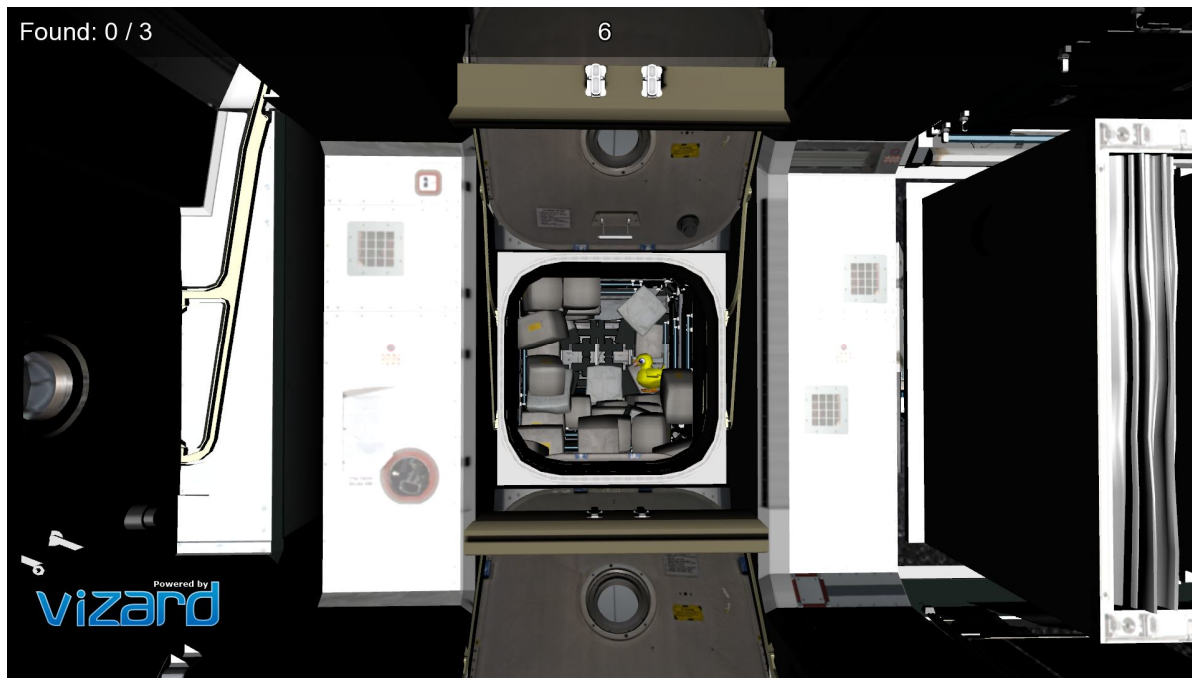
ISS Interior Exploration

```
space_explorer.py  space_walk.py  iss_interior.py  solar_system_explorer.py
142     vizfx.postprocess.addEffect(gray_effect)
143
144     def DisplayInstructionsTask():
145         """Task that display instructions and waits for keypress to continue"""
146         global pigeon
147         panel = vizinfo.InfoPanel(INSTRUCTIONS, align=viz.ALIGN_CENTER, fontSize=22, icon=False, key=None)
148         pigeonClone = pigeon.clone(scale=[200]*3)
149         pigeonClone.addAction(vizact.spin(0, 1, 0, 45))
150         pigeonClone.enable(viz.DEPTH_TEST, op=viz.OP_ROOT)
151         panel.addItem(pigeonClone, align=viz.ALIGN_CENTER)
152         yield viztask.waitKeyDown(' ')
153         panel.remove()
154
155     def TrialCountDownTask():
156         """Task that count downs to time limit for trial"""
157
158         # Action for text fading out
159         text_fade = vizact.parallel(
160             vizact.fadeTo(0,time=0.8, interpolate=vizact.easeOut),
161             vizact.sizeTo([1.5, 1.5, 1.0], time=0.8, interpolate=vizact.easeOut)
162         )
163
164         # Reset time text
165         global time_text
166         time_text.clearActions()
167         time_text.alpha(1.0)
168         time_text.color(viz.WHITE)
169         time_text.setScale([1, 1, 1])
170         time_text.message(str(int(TRIAL_DURATION)))
171
172         # Countdown from time limit
173         start_time = viz.getFrameTime()
174         last_remain = int(TRIAL_DURATION)
175         time_played = viz.getFrameTime() - start_time
176         #while (viz.getFrameTime() - start_time) < TRIAL_DURATION:
177         global game_is_running
178         while time_played < TRIAL_DURATION:
179             if game_is_running:
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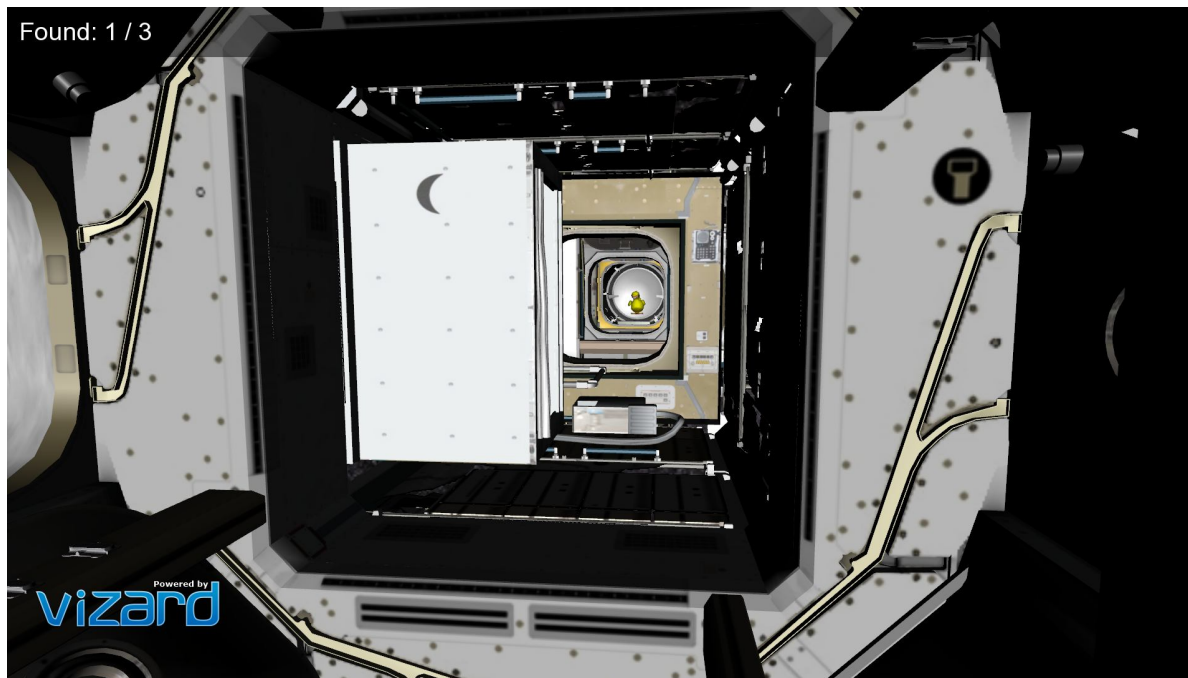
ISS Interior Exploration - screen captures



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