

picoCAD

A tiny modeller for tiny models.
Version 1.0.1

Twitter
Discord
Itch

<https://twitter.com/johanpeitz>
<https://discord.gg/hjXMammPB>
<https://johanpeitz.itch.io/picocad>

Welcome to picoCAD!

picoCAD is a program to build and texture low poly 3D models. I needed something simple to create simple models and found all other programs bloated and overly complicated, so I decided to roll my own.

Since picoCAD is built with PICO-8 it comes with pretty harsh limitations. This is fine, since it encourages the use of even less polygons. Be smart and creative and anything is possible!

Credits

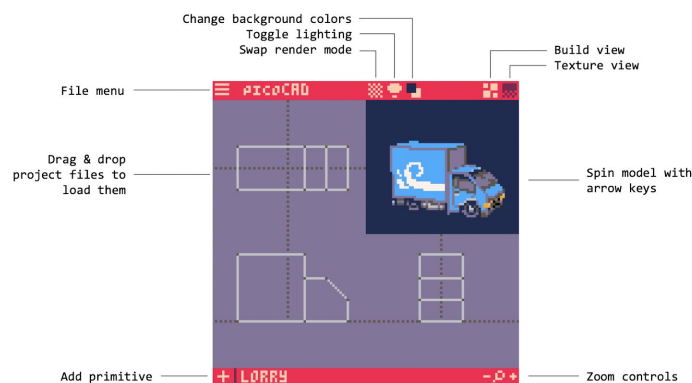
Created by Johan Peitz, [@JohanPeitz](https://twitter.com/JohanPeitz)

3D math and fill routines adapted from Frederic Souchu, [@FSouchu](https://twitter.com/FSouchu)

Built on the PICO-8 platform created by Joseph White, [@Lexaloffle](https://twitter.com/Lexaloffle)

Overview

Use the following screens to get an overview of how to use picoCAD. But read on, there is a lot to discover!



Reference manual

Basic controls

Use mouse and keyboard to control all aspects of picoCAD. Using shortcut keys will greatly speed up the workflow. In general:

Left mouse button	Select vertices or faces Hold X to select multiple
Left mouse button + move mouse	Move whatever is selected
Right mouse button	Bring up the context menu
Space	Toggles 2x2 view or full view
Esc	System menu (quit/windowed mode/etc)
ctrl/cmd+Z	Undo last performed action
Mouse wheel	Zoom in and out
Arrow keys	Move whatever is selected
Arrow keys	Move or spin the camera (when nothing is selected)

For ease of use, most actions snap to a grid. This might feel cumbersome in the beginning but is of great help to make things manageable at the low resolution.

File management

picoCAD stores your work in text files. These are easily readable and editable in case you want to take your work elsewhere. Due to limitations in the pico8 platform, files will be stored in the following location, regardless where you load them from.

Windows


`%appdata%/Roaming/pico-8/appdata/picocad/`

OSX

`~/Library/Application Support/pico-8/appdata/picocad/`

Linux

`~/.lexaloffle/pico-8/appdata/picocad/`

This folder can be opened via the “View files” option in the  menu.

Also, beware that there is no warning before quitting or overwriting unsaved work, so save your work often!

For file handling and exports to work properly, please make sure you are running the program with administrator rights.



Loading projects

To load a previously saved picoCAD project, simply drag the txt file into the picoCad window.

Please note: picoCAD cannot remember where you loaded the project from, so when saved it will end up in the same directory as everything else (see folders above).

Views

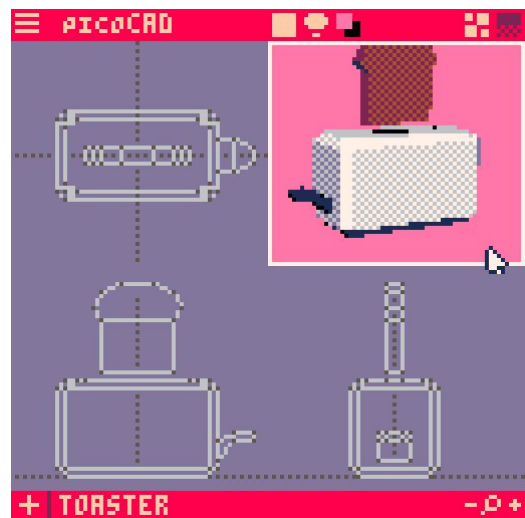
picoCad is structured around two views; build and texture. In the build view you place and manipulate meshes, and in the texture view you can move around UV coordinates. Toggle between the views with the top right buttons on the toolbar (or press V).

Both views support all three different render modes: wireframe, fill, and texture. Swap between them with the  button. When in fill or texture mode, you can also toggle shading on or off with the  button.

Build view

The build view shows whatever you're building from three directions - one for each axis, and a fourth 3D view. The general idea is that you build your model by placing and manipulating meshes and vertices in the three views, seeing the result in the 3D view. In each viewport you can use the arrow keys to move the camera around.

Press SPACE over the viewport you're in to toggle between full screen and 2x2. Working in full screen can really help when your models become more complex.



Moving meshes

Grab a mesh with the left mouse button and drag it to where you want it. This moves the mesh's origin point as well which is important if you start rotating things.

Selecting and moving vertices

Click vertices to select them. Select multiple vertices by holding down X. To select multiple vertices in one go, draw a rectangle with the left mouse button and any vertices inside the rectangle will be selected.

Hovering over faces takes precedence over selecting vertices so if you can't reach a specific vertex, hold X to force vertex selection.

Any selected vertices can then be moved by either dragging them directly with the mouse, or by using the arrow keys. Moving vertices does not move the mesh's origin point, which is important if you later rotate the mesh.

Adding meshes

Click the [+] button to choose a volume to add. Right clicking almost anywhere also opens the same menu. By using the available meshes creatively you should be able construct most things.

Mesh and face menu

Right click a face in a mesh to access additional mesh/face functionality.

Color mesh	Set the color for the whole mesh used in fill mode.	
Extrude face	Extrude a face in the direction of it's normal. For UV coordinates of the new faces, picoCAD makes a best guess. Adjust them in the texture view.	
Rotate mesh	Mesh is rotated around its center by 45 degrees. Use different viewports to rotate around different axes.	
Face props.	Opens a submenu with face specific options.	
	Color	Set the color for this face only.
	Double sided	Face will be visible from both sides.
	No shading	Face will not be shaded when lighting is on.
	No texture	Face will use solid fill instead of texture when in texture mode.
	Render first	Face will be rendered before all other faces.
Delete face	Delete the highlighted face.	
Delete mesh	Deletes the whole mesh of the highlighted face.	
Clone mesh	Creates a copy of the current mesh and adds it to the scene.	

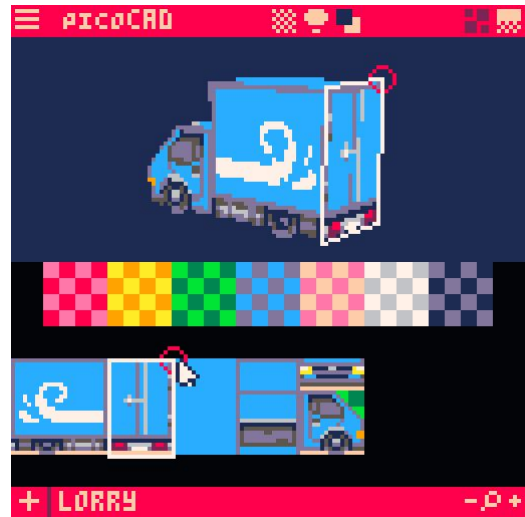
Texturing view

This view is split between a 3D viewport and the texture. Hover over faces in the model to see which part of the texture it is using.

Manipulating UV coordinates

Click a face to be able to show it's UV coordinates on the texture. You can now drag the UVs to where you want them. To quickly rotate the UVs of a face, hover over it (or select it) and press R.

To use more of the texture than what is shown in the window, scroll it with up and down arrows or the mouse wheel.



Importing textures

Simply drag and drop a 128x128 PNG texture onto the program to use it for texturing (this cannot be undone). Colors will be adjusted to fit the pico-8 palette, and the texture will be saved in the project file.

Note that picoCAD needs some of the texture memory for internal use, so only the first 120 lines of the texture will be used.

Bits and pieces

Background color

Use the palette button to choose the background color to use in the 3D viewport as well as which color to treat as alpha in texture mode.

Mesh centre

Each mesh has a centre point, represented by a red dot when you hover over the mesh with the mouse. When rotating the mesh, it will rotate around it's centre. If you drag the mesh around, the center point will follow. To move the center point, select all vertices and move them - they will then be moved while the center point stays.

Project size cap

picoCAD is focused on small models and will restrict the data of your work to 16kB. An indicator will show up at the bottom of the screen when you're closing in on the cap.

Shortcuts and workflow tips

Speed up your workflow by using these shortcuts:

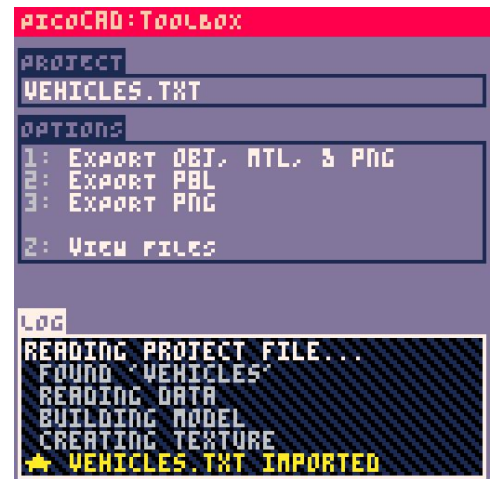
Select multiple vertices/UVs	hold X and keep selecting
Select vertices inside meshes	hold X and select
Disable snap to grid	hold Z when selecting/moving
Swap render mode	M
Toggle shading on/off	L
Swap between build and texture views	V
Rotate UVs	select face + R
Export GIF rotating in opposite direction	hold X when starting a GIF export
Toggle fullscreen viewport fullscreen	SPACE
Extrude face	hover over a face + E
Rotate mesh	hover over a mesh + R or T
Show face property menu	hover over a face + F
Save project	cmd + S
Zooming	mouse wheel up/down
Add a mesh	right click on an orthogonal viewport
Reset zoom and pan	double click build view button

Exporting to other formats

picoCAD comes with a program called “toolbox” which allows you to export the picoCAD project files to various other formats.

Launch the toolbox and drag and drop the project you want to export onto the program. Once loaded, choose the export option you want and the files will be created.

picoCAD is not able to export pngs with alpha, so some post-editing may be needed on the texture.



Please note that files will be overwritten without prompting so make sure you know what you're doing.

Thanks

All the testers for helping me find gnarly bugs as well as ironing out the workflow (in no particular order):

Antonio Menteguiaga, Pit, Waporwave, Jack Raymond, Jeiel Aranal, Khari Addison, Preston Bruner, Miguel Sánchez, Annette Pew, Woolion, Chi Wong, Johan Vinet, Thomas Leroy, errik, Riccardo Santangelo, and some who didn't respond to whether they wanted their names in here.

The PICO-8 community for being ever inspiring and supportive.

Version history

v1.0.1

- picoCAD
 - Added ability to disable snap to grid when moving vertices and meshes (for real this time)
 - Added title to window
 - Changed GIF save name to use project name (eg banana_0.gif)
 - Removed outdated reference to desktop when saving gif
 - Removed p8l export from main application
 - Fixed model being wiped when reaching end of undo buffer
 - Fixed faces occasionally being highlighted during gif export
 - Fixed rotation via menu rotating around the wrong axis in some cases
- toolbox
 - Added functionality to export obj, mtl, png
 - Added functionality to export p8l
 - Added functionality to export png

v1.0

- Added ability to to disable snap to grid when moving vertices and meshes (hold Z)
- Tweaked spin speed in model view to be a bit faster
- Fixed crash when attempting to save with empty filename
- Fixed some actions not creating undo states
- Fixed textures not loading properly if only colors 0-9 where used

v0.9.13 - RC4

- Tweaked spin speed in model view to be a bit slower
- Tweaked toast messaged to stay on screen a bit longer
- Removed the * next to filename that was displayed if unsaved changes
- Fixed normals getting funky when merging vertices (and other special cases)

v0.9.12 - RC3

- Added a dithered shading step for textures
- Removed ability to save empty scenes.
- Tweaked the size and position of some ui elements
- Tweaked the colors used for the GIF watermark
- Fixed rectangle select not working in model viewport
- Fixed mesh center points not being drawn unless in wireframe mode
- Fixed color and zoom settings in project file being ignored
- Fixed project colors not being set correctly in some circumstances
- Fixed double sided planes flashing during some circumstances

v0.9.11 - RC2

- Added a [+] button for simple mesh adding
- Tweaked position of version string on about screen
- Fixed color menu not showing if clicking too far to the right on a menu option
- Fixed filename being displayed on top of save as prompt
- Fixed meshes not being draggable in ortographic viewports unless in wireframe mode

v0.9.10 - RC1

- Changed positions of most UI elements
- Removed ability to change render mode in orto views
- Fixed config issue causing slow spinning gifs to cut short
- Fixed gif menu showing up when clicking on a specific place
- Fixed gif export being choppy if scene suffered from low framerate
- Fixed vertices getting unselected when changing render mode
- Fixed project size not being recalculated on undo

v0.9.9

- Added a cap on how much content can be put into a single scene (16kB)
- Added toast message when hitting content cap
- Added a visual cue when approaching content cap
- Added different spinning speeds when exporting GIF
- Added functionality to rotate GIF in opposite direction (hold X when selecting in menu)
- Added ability to reset all views to default by clicking build view icon when already in build view
- Removed zoom reset button (1:1)
- Removed 1px border being applied to all viewports
- Changed position of #picoCAD watermark not to collide with GIF tag on Twitter
- Changed colors on message toast
- Changed looks and content on About screen
- Fixed undo buffer from being wiped if running out of memory
- Fixed texture not being reset when starting new project
- Fixed filename input not allowing numbers
- Fixed being able to scroll texture too far
- Fixed viewports ending up in a funky state when importing a project while in texture view

v0.9.8

- Added shortcut to face property menu (press F while hovering a face)
- Added #picoCAD tag when exporting gif
- Removed menu borders when exporting gif
- Removed zoom percentage indicator
- Removed limit when zooming out
- Removed WASD mapping as is clashed with other keys and had different mapping on different systems

- Removed ! indicator (cpu>100%)
- Changed so that GIF export saves in the same directory as everything else
- Changed menu option from OPEN to VIEW FILES
- Fixed zoom levels not being set properly on loading a model
- Fixed not being able to scroll texture with mouse wheel if a vertex was selected
- Fixed shading being inverted on the back of double sided faces
- Fixed crash caused by rotating a texture when no face was selected
- Fixed crash caused by loading files too big (>32k-ish)
- Fixed faces passing through the camera from being rendered twisted
- Fixed views not resetting properly when starting a new project

v0.9.7

- Added ability to start new project from menu
- Added ability to open folder where picoCAD saves everything
- Added ability to scroll the texture with mouse wheel
- Added ability to use WASD as well as arrow keys
- Added window mode to be default on first launch
- Added hovered UVs on textures being highlighted in the model viewport
- Added ability to select vertices inside meshes buy holding down X
- Added plane primitive
- Reversed mouse wheel scroll direction
- Adjusted perspectiveness to be less extreme
- Adjusted vertex selection to standard interaction models
- Fixed non-shaded textures not handling transparency correctly when lit
- Fixed top left 8x8 of texture not being usable
- Fixed cameras moving when entering filenames
- Fixed UV selection getting messed up when rotating UVs
- Fixed files being written to obscure pico8 path instead of sane location, new locations:
 - Windows: %AppData%/Roaming/pico-8/appdata/picocad/
 - OSX: /Users/Yourname/Library/Application Support/pico-8/appdata/picocad/
 - Linux: ~/.lexaloffle/pico-8/appdata/picocad/

v0.9.6

- Rolled back save fix, files are now saved as before (in mystery folder)
- Added minimum and maximum to zoom levels
- Added near camera clipping
- Added mouse wheel zoom
- Adjusted lighting settings
- Adjusted the rotation speed when recording gifs to be 10% faster
- Fixed 3D view not using perspective projection
- Fixed unlimited undo buffer leading to out of memory crash
- Fixed normals not being recalculated when dragging vertices
- Fixed crash caused by zooming in until division by zero occurred

- Fixed distorted frames appearing when recording gif of heavy models
- Fixed visibility check sometimes being a bit off
- Fixed crash caused by selecting “-----” from the menu

v0.9.5

- Added display of mesh origio when hovering a mesh in wireframe mode
- Added ability to rotate meshes in both directions using R & T keys
- Changed direction of movement when moving the camera with the arrow keys in an orthogonal viewport
- Changed cylinder primitive to be on grid
- Change pentagonal prism primitive to center around it's origo
- Adjusted light source to be slightly more from above
- Adjusted mouse and vertex interaction to be more forgiving
- Adjusted shading angles when using textures
- Fixed files being written to obscure pico8 path instead of program root
- Fixed color selection menu not resetting properly, causing the wrong things to be colored
- Fixed crash caused by changing render mode with the M key while hovering a face

v0.9.4

- Optimised vertex pipeline for slight (10%) performance increase
- Fixed viewports getting out of sync when moving camera in full screen
- Fixed view buttons creating strange states when pressed repeatedly
- Fixed texture coordinates getting messed up if texture was scrolled all the way down
- Fixed undo state not being created when changing face properties
- Fixed undo state not being created when cloning a mesh
- Fixed crash caused when menu was opened in the model view but selected over the texture

v0.9.3

- Added individual face properties (back-face rendering, ignore shading, ignore texture, color, render order) for faces and access via menu
- Added graceful error fallback on trying to import a non-picoCAD project
- Fixed so that the full version number is visible on the credits screen
- Fixed UV rotations not being stored in the project properly
- Fixed the build menu being accessible from texturing view
- Fixed deleting mesh not creating an undo state
- Fixed p8l export concatenating data instead of creating a new file
- Fixed hovering a face before entering the texture map conflicting with the selected face
- Fixed model from rotating when scrolling the texture
- Fixed uvs from not being selected if texture is scrolled

v0.9.2

- Added ability to scroll in texture view to use full texture

- Added a default texture
- Added ability to rotate face UVs
- Adjusted shading palette for pink and peach
- Adjusted model spinning speed when exporting to GIF
- Removed ability to rotate meshes in 3D viewports
- Fixed some primitives not spawning face up
- Fixed default UVs for all primitives
- Fixed so that texture doesn't scroll when rotating model in texturing view

v0.9.1

- Fixed texture being 1px offset when reading from txt file
- Fixed compatibility issues in txt file between mac and pc
- Fixed crash when right-clicking selected vertices
- Fixed crash when undoing into an empty scene

v0.9

- First beta release