A CAD TOOLKIT PATCH FOR ESP-R

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Abstract

This CAD Toolkit patch is a productivity tool for esp-r. It lets you build CAD models in 3D, view it colour rendered in VR, create esp-r zone and connection files, and make esp-r simulations fast, interesting and fun. This document describes how to patch it to esp-r and run on Ubuntu Linux.

1 Pre-requisite

Esp-r is installed and fully functional[1].

2 Apply the CAD Toolkit patch

Obtain and install the latest CAD Toolkit patch:

```
sudo ./esp-r-cad-patch-i686-built-ddmmyy.bin (for 32-bit system)
sudo ./esp-r-cad-patch-x86_64-built-ddmmyy.bin (for 64-bit system)[2]
sudo ./esp-r-cad-patch-uninstall-ddmmyy.bin (to safely remove the patch)
```

3 Modify environment variables

Add the following lines to your .profile, assuming the PATH variable to run esp-r is correctly set:

```
export ESPRHOME="/usr/esru/esp-r"  (change if in different path)
export XAPPLRESDIR="$ESPRHOME/app-defaults"
```

Use the Linux `ldconfig` facility to configure your Dynamic Linker Run Time Bindings, making it pointing to `$ESPRHOME/lib`.

If you use the LD_LIBRARY_PATH variable make sure it is fully functional[3].

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[1] https://www.strath.ac.uk/research/energysystemsresearchunit/applications/esp-r/
[2] The VR module akrobat is not working on 64-bit Ubuntu due to restriction by commercial library.
[3] Ubuntu partially disabled some functions of LD_LIBRARY_PATH on security ground.

4   Using the CAD Toolkit

Type the command *gtool* in an Ubuntu Terminal starts the CAD Toolkit. <u>Figure 1</u>.
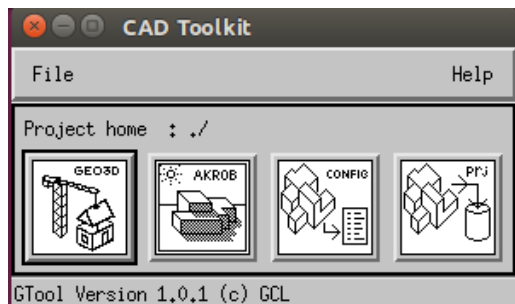

Figure 1 gtool top level window

Two exemplars are installed in the folder `$HOME/samples/esp-r`. The handshaking between the CAD Toolkit and esp-r is demonstrated here using the project `i-model`:

1. Create a new esp-r project
    a) Click the fourth button to start *prj*. Create a new esp-r project, name it `i-model`;
    b) Create four dummy zones and name them `i-model_01, i-model_02, ..., i-model_04`.
    c) Save the project and exit *prj*.

2. Create your CAD model
    a) Click '<u>File</u> -> <u>Set project home</u>' and navigate **into** the esp-r project folder, `i-model`;
    b) Click the first button to start the app *geo3d*;
    c) Create a CAD model with four zones. The CAD model may be any form and shape. Naming for zones is arbitrary. Save the CAD model with the name `i-model.vef`, <u>Figure 2</u>.

3. View the model in 3D colour rendered interactively
    a) Click the second button to start the app *akrobat;*
    b) Click '<u>File</u> -> <u>Open</u>' to open the CAD model;

4. Handshaking with esp-r
    a) Click the third button to start the app *config*;
    b) Click '<u>File</u> -> <u>Open CAD model</u>' to load the CAD model, `i-model.vef`;
    c) Click '<u>View</u> -> <u>show CAD</u>' to display the CAD model in solid form;
    d) Click '<u>File</u> -> <u>Make esp-r Zones</u>' to generate esp-r zones and connections;
    e) Click '<u>File</u> -> <u>Update esp-r Project</u>' to overwrite the dummy zones in the esp-r project with the zones and connections of the CAD model you created;
    f) Click '<u>File</u> -> <u>Convert CAD to Plan</u>' if you want to save the model in VEW format for colour rendering using *akrobat* or displaying using esp-r viewer.

5. Continue with your esp-r project
    a) Click the fourth button to start *prj*.
    b) Click 'open existing -> other', enter `i-model`; The CAD model is displayed, <u>Figure 3</u>;
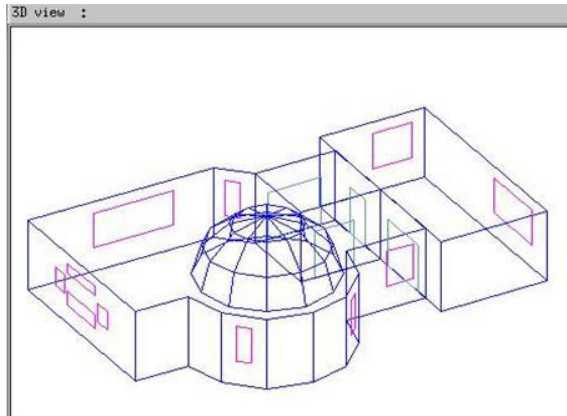   c) Continue working with your esp-r project as usual …
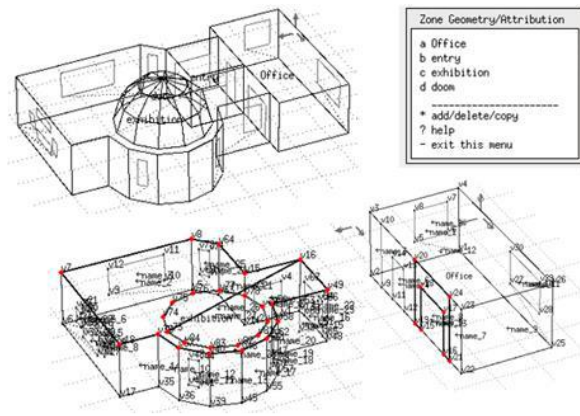
Figure 2 The CAD building model

Figure 3 The CAD model in esp-r

5   Issues and tips

- The second exemplar, `i-home`, is a detached home with 16 zones, <u>Figure 4</u>. I added a few touches to the PLAn model making it interesting to look and fun to work with, <u>Figure 5</u>.
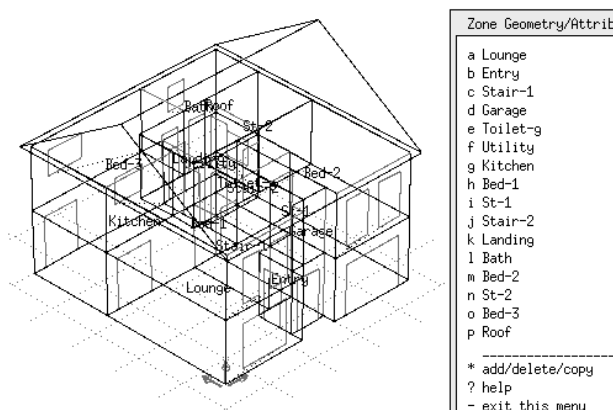

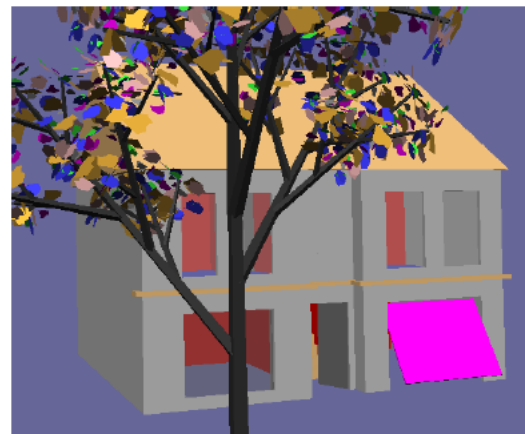
Figure 4 The CAD building model in esp-r

Figure 5 The building model colour rendered

- When generating zones from the CAD model, some surfaces are split up to match the shapes of the neighbouring zones. This causes warnings of 'enclosure bounding'. These warnings are benign to esp-r simulations[4].

- It often saves time recycling old esp-r projects. Replace zones within an old project and then update its zone geometry and connection files using the CAD Toolkit. The operations, constructions and control of the old project can be reused. The naming convention for project and zone files apply.

- The esp-r hidden line removal and geometry export also create VEW files with default name `project_name.vew`. Not to be confused with the VEW model created by the CAD Toolkit.

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[4] The surfaces that causing warnings already contain essential sets of vertices for polygon calculations.