PPTool

– A Phase Plane Analysis Tool

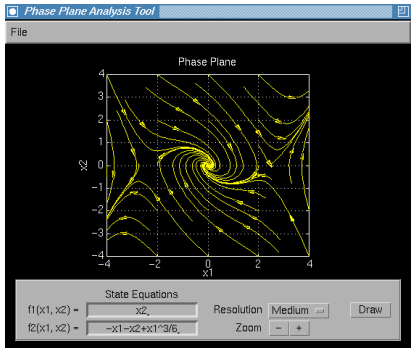

Figure 0.1 The user interface of pptool

PPTool is a simple Matlab program that constructs the phase plane for a nonlinear system in the plane. The program is written as a single `m-file` for Matlab version 4.2. PPTool can be retrieved from the WWW-address

`http://www.control.lth.se/~mikaelj/controlsoft.html`

Starting PPTool

After installing `pptool.m`, pptool is started by the matlab command

```
>> pptool
```

Specifying a nonlinear system

The nonlinear system

$$\dot{x}_1 = f_1(x_1, x_2)$$
$$\dot{x}_2 = f_2(x_1, x_2)$$

is defined by entering matlab-expressions for the functions $f_1(\cdot)$ and $f_2(\cdot)$ in the "State Equation" edit boxes. Note that state variable x_1 is denoted `x1` and state variable x_2 is denoted `x2`. Thus, we can define the Duffing equation

$$\dot{x}_1 = x_2$$
$$\dot{x}_2 = -x_1 - x_2 + x_1^3/6$$

by entering the expression

```
x2
```

in the editbox for the f_1 equation, and

```
-x1-x2+x1^3/6
```

in the editbox for the f_2 equation.

Zooming

It is possible to zoom in using the "+" button, and zoom out using the "–" button.

Drawing the Phase Plane

Automatic Initial Value Gridding

By pressing the "Draw" button, a phase plane is constructed automatically. The initial values are spread uniformly over the part of the phase plane currently shown in the axes. It is possible to influence the number of initial values by the "Resolution" pop-up menu.

Manual Insertion of Initial Values

It is also possible to manually specify initial values, simply by indicating the desired initial value and clicking the left mouse button.