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Abstract—This manual shows how to balance chemical equations using matrices.

Download python codes using

```
svn co https://github.com/gadepall/school/trunk/
training
```

Download the codes from below link

```
svn co https://github.com/pratibha444/icoboard
```

1 COMPONENTS

The necessary components for this manual are listed in Table

Component	Quantity
Icboard	1
Raspberry Pi 4	1
Male-Male Jumper Wires	20
Breadboard	1
Seven segment display	1

TABLE 0

2 SOFTWARE SETUP

2.1 Icboard

For installing icoboard Open a terminal and execute the following commands.

```
git clone https://github.com/WiringPi/WiringPi.git
cd WiringPi && ./build
sudo apt install build-essential clang bison flex
libreadline-dev gawk tcl-dev libffi-dev
mercurial graphviz xdot pkg-config libftdi-
dev
```

#Icoprog

#On termuxarch run as root user

#With termuxarch and pizero, this is the only tool required at the pi

```
svn co http://svn.clifford.at/handicraft/2015/icoprog
cd icoprog && make install
```

#Icestorm

#On termuxarch run as normal user without sudo

```
git clone https://github.com/cliffordwolf/icestorm
cd icestorm && make -j4 && sudo make install
```

#arachne-pnr

#On termuxarch run as normal user without sudo

```
git clone https://github.com/cseed/arachne-pnr
cd arachne-pnr && make -j4 && sudo make
install
```

#Yosys

#On termuxarch run as normal user without sudo

```
git clone https://github.com/cliffordwolf/yosys
cd yosys && make -j4 && sudo make install
```

3 HARDWARE SETUP

3.1 4 bit binary input

- The hardware connections between the Icboard and Raspberry Pi 4 are available in

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below figures.

- In figure 2 and 3 the Icoboard and raspberry pi connections are shown. And fig 4 shows the Raspberry Pi pin configuration.
- Place icoboard on Raspberry Pi 4 and make the connections according to following steps:
- Take the wires and connect them to A5,A2,C3,B4 of the icoboard . These pins are used to give input manually.
- Similarly make connection to GND pin and 3.3V pin of Icoboard
- Connect GND and 3.3V pin on the bread board
- Give the binary input using input pins .
- For example connect all the input pins to GND pin on bread board
- Now open the terminal give the following commands

```
cd icoboard
cd trunk
cd codes
cd Binary
make v_fname=binary
python binary.py
```

- The output is displayed on terminal as 0
- Similarly you can change the values.
- If 1 is to be given as input connect it to 3.3V pin and if 0 is to be given as input then connect it to GND pin.

3.2 Seven segment display

Make the connections according to the Tabel II. The pin configuration of seven segment display is shown in fig 1.

- Open the terminal and execute the following commands

```
cd icoboard
cd codes
cd trunk
cd seven
make v_fname=seven
```

Seven segment display	Icoboard
a	A5
b	A2
c	C3
d	B4
e	B7
f	B6
g	B3
COM	3.3v

TABLE 0

```
python seven.py
```

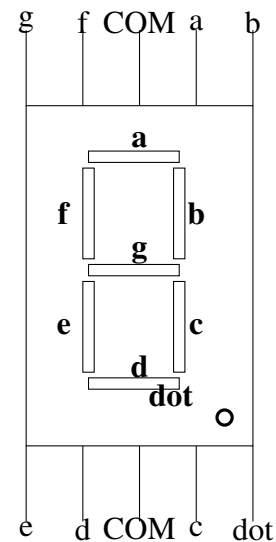


Fig. 0: SSD pin configuration

