QCG – Drawing Quantum Circuits in Metapost

Andreas Klappenecker

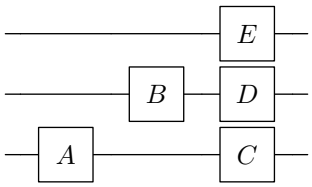
Compiling this Code. You can compile this file as follows.

```
pdflatex circ_ex.tex
mpost -tex=latex circ_ex.mp
pdflatex circ_ex.tex
```

Simple Gates. We can specify a quantum circuit with three qubits an some single-qubit gates as follows.

```
\begin{center}
\begin{emp}(50,50)
  qubits(3);
  wires(2mm);
  gate(gpos 0, btex $A$ etex);
  gate(gpos 1, btex $B$ etex);
  gate(gpos 0, 1, 2, btex $C$ etex, btex $D$ etex, btex $E$ etex);
  wires(2mm);
\end{emp}
\end{center}
```

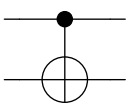
The resulting circuit is given as follows.



Controlled Not Gate. A controlled-not gate $\Lambda_{1,0}(X)$ acting on two quantum bits can be described by

```
\begin{center}
\begin{emp}(50,50)
  qubits(2);
  wires(2mm);
  cnot(icnd 1, gpos 0);
  wires(2mm);
\end{emp}
\end{center}
```

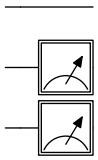
The resulting circuit is given by



Measurements. Measurements are specified in the following way.

```
\begin{center}
\begin{emp}(50,50)
  qubits(3);
  wires(2mm);
  measure(0,1);
\end{emp}
\end{center}
```

The circuit looks as follows.



Teleportation. A more extensive example illustrating the teleportation circuit is given below.

```
\begin{center}
\begin{emp}(50,70)
 setunit 2mm;
 qubits(3);
 label.lft(btex \textup{Alice} etex, (QCxcoord, QCycoord[2]));
 label.lft(btex \textup{Alice} etex, (QCxcoord, QCycoord[1]));
 label.lft(btex \textup{Bob}   etex, (QCxcoord, QCycoord[0]));
 wires(0.5cm);
 cnot(icnd 2, gpos 1);
 gate(gpos 2, btex $H$ etex);
 measure(1,2);

 dropwire(1,2);
 circuit(2.0cm)(gpos 0,0, btex  \begin{minipage}{1.8cm}
 \small Apply \\[-1mm] corrections \end{minipage} etex);
\end{emp}
\end{center}
```