

Pensieve header: Experiments with graphs.

`Graph[{1 ↔ 2}]`



`vs = Tuples[v[0, 1], 4]`

```
{v[0, 0, 0, 0], v[0, 0, 0, 1], v[0, 0, 1, 0], v[0, 0, 1, 1], v[0, 1, 0, 0], v[0, 1, 0, 1],
 v[0, 1, 1, 0], v[0, 1, 1, 1], v[1, 0, 0, 0], v[1, 0, 0, 1], v[1, 0, 1, 0],
 v[1, 0, 1, 1], v[1, 1, 0, 0], v[1, 1, 0, 1], v[1, 1, 1, 0], v[1, 1, 1, 1]}
```

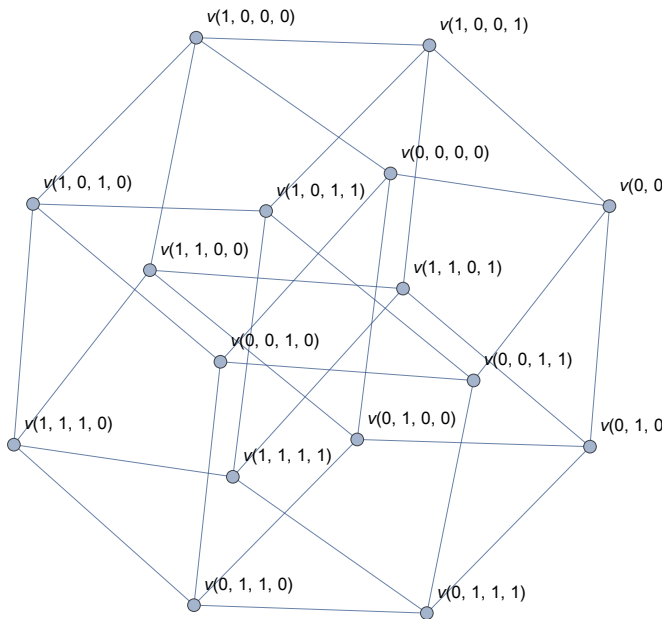
`es = Flatten@Table[`

```
  Insert[#, •, k] & /@ Tuples[e[0, 1], 3],
  {k, 4}
```

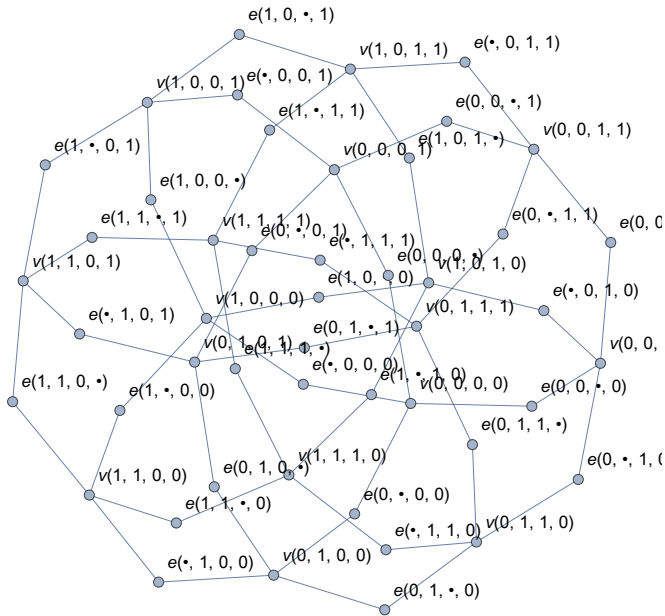
`]`

```
{e[•, 0, 0, 0], e[•, 0, 0, 1], e[•, 0, 1, 0], e[•, 0, 1, 1], e[•, 1, 0, 0], e[•, 1, 0, 1],
 e[•, 1, 1, 0], e[•, 1, 1, 1], e[0, •, 0, 0], e[0, •, 0, 1], e[0, •, 1, 0], e[0, •, 1, 1],
 e[1, •, 0, 0], e[1, •, 0, 1], e[1, •, 1, 0], e[1, •, 1, 1], e[0, 0, •, 0],
 e[0, 0, •, 1], e[0, 1, •, 0], e[0, 1, •, 1], e[1, 0, •, 0], e[1, 0, •, 1],
 e[1, 1, •, 0], e[1, 1, •, 1], e[0, 0, 0, •], e[0, 0, 1, •], e[0, 1, 0, •],
 e[0, 1, 1, •], e[1, 0, 0, •], e[1, 0, 1, •], e[1, 1, 0, •], e[1, 1, 1, •]}
```

`Graph[({(v@@# /. • → 0) ↔ (v@@# /. • → 1)}) & /@ es, VertexLabels → "Name"]`



```
g = Graph[Flatten[
  { (v@@# /. . -> 0) -> #, # -> (v@@# /. . -> 1) } & /@ es
], VertexLabels -> "Name"]
```



```
pf = FindShortestPath[g]
```

```
ShortestPathFunction[{All, All}, <<>>]
```

```
pf[v[0, 0, 0, 0], v[1, 1, 1, 1]]
```

```
{v[0, 0, 0, 0], e[0, ., 0, 0], v[0, 1, 0, 0], e[., 1, 0, 0],
 v[1, 1, 0, 0], e[1, 1, 0, .], v[1, 1, 0, 1], e[1, 1, ., 1], v[1, 1, 1, 1]}
```

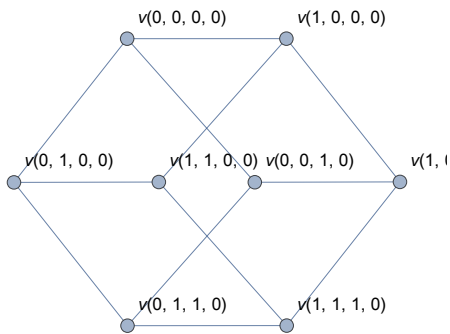
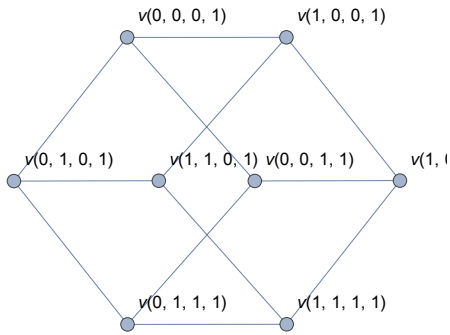
```
es1 = Flatten@Table[
```

```
  Insert[#, ., k] & /@ Tuples[e[0, 1], 3],
```

```
  {k, 3}
```

```
];
```

```
g1 = Graph[({(v@@# /. . -> 0) ↔ (v@@# /. . -> 1)} & /@ es1, VertexLabels -> "Name"]
```



```
FindShortestPath[g1, v[0, 0, 0, 0], v[1, 1, 1, 0]]
{v[0, 0, 0, 0], v[1, 0, 0, 0], v[1, 0, 1, 0], v[1, 1, 1, 0]}
```

```
FindShortestPath[g1, v[0, 0, 0, 0], v[1, 1, 1, 1]]
{}
```

```
ConnectedComponents[g1]
{{v[0, 0, 0, 1], v[1, 0, 0, 1], v[0, 1, 0, 1], v[0, 0, 1, 1],
  v[1, 1, 0, 1], v[1, 0, 1, 1], v[0, 1, 1, 1], v[1, 1, 1, 1]},
 {v[1, 1, 0, 0], v[0, 1, 0, 0], v[1, 0, 0, 0], v[1, 1, 1, 0],
  v[0, 0, 0, 0], v[0, 1, 1, 0], v[1, 0, 1, 0], v[0, 0, 1, 0]}}
```

**? Graph**

Graph[{e<sub>1</sub>, e<sub>2</sub>, ...}] yields a graph with edges e<sub>j</sub>.  
 Graph[{v<sub>1</sub>, v<sub>2</sub>, ...}, {e<sub>1</sub>, e<sub>2</sub>, ...}] yields the graph with vertices v<sub>i</sub> and edges e<sub>j</sub>.  
 Graph[{{..., w<sub>i</sub>[v<sub>i</sub>, ...], ...}, {{..., w<sub>j</sub>[e<sub>j</sub>, ...], ...}}]  
 yields a graph with vertex and edge properties defined by the symbolic wrappers w<sub>k</sub>. >>