

BDF Font translation

■ Initialization

```
In[1]:= Off[General::spell, General::spell1]
```

■ Function to expand hex numbers into bits

```
In[2]:= HexExpand = Function[{hex}, Sign[BitAnd[ToExpression["16^^" <> hex], #]] & /@  
Table[2^b, {b, 4 StringLength[hex] - 1, 0, -1}]]
```

```
Out[2]:= Function[{hex}, (Sign[BitAnd[ToExpression[16^^ <> hex], #1]] &) /@  
Table[2^b, {b, 4 StringLength[hex] - 1, 0, -1}]]
```

■ Function to compress bit array into words

```
In[3]:= WordBuild = Function[{bitarray}, Fold[2 #1 + #2 &, 0, bitarray]]
```

```
Out[3]:= Function[{bitarray}, Fold[2 #1 + #2 &, 0, bitarray]]
```

Import and process

```
In[4]:= SetDirectory["."]
```

```
Out[4]:= /home/cmaier/Hackerspaces/sinobit/zpix-pixel-font/transmogrify
```

```
In[5]:= FileNames[]
```

```
Out[5]:= {1985font.bdf, 1985short.bdf, BDF_font_translation.nb,  
experimentalfont.c.snippet, experimentalfont.dat2}
```

```
In[6]:= bdfLines = StringSplit /@ Import["1985font.bdf", "Lines"];
```

```
In[7]:= bdfLines
```

```
Out[7]:= {{STARTFONT, 2.1},  
{FONT, -FontForge-1985font-Medium-R-Normal--8-80-75-75-M-80-ISO8859-1},  
{SIZE, 8, 75, 75}, {FONTBOUNDINGBOX, 8, 10, 0, -3},  
{COMMENT, "Generated, by, fontforge,, http://fontforge.sourceforge.net"},  
{COMMENT, "Created, by, Christoph, Maier,,, with, FontForge, 1.0,  
(http://fontforge.sf.net)"}, {STARTPROPERTIES, 26}, {FOUNDRY, "FontForge"},  
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{00}, {00}, {ENDCHAR}, {STARTCHAR, bar}, {ENCODING, 124}, {SWIDTH, 1000, 0},
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{08}, {10}, {10}, {20}, {00}, {00}, {00}, {ENDCHAR}, {STARTCHAR, asciitilde},
{ENCODING, 126}, {SWIDTH, 1000, 0}, {DWIDTH, 8, 0}, {BBX, 8, 10, 0, -3}, {BITMAP},
{00}, {00}, {20}, {54}, {08}, {00}, {00}, {00}, {00}, {00}, {ENDCHAR}, {ENDFONT}}

In[8]:= Transpose[Flatten[Position[bdfines, #]] & /@ {"STARTCHAR", _}, {"ENDCHAR"}]];
charlines = Take[bdfines, #] & /@ %

Out[9]:= {{STARTCHAR, space}, {ENCODING, 32}, {SWIDTH, 1000, 0},
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{00}, {00}, {00}, {00}, {00}, {00}, {00}, {ENDCHAR}},
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{10}, {10}, {10}, {00}, {10}, {00}, {00}, {00}, {ENDCHAR}},
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{48}, {00}, {00}, {00}, {00}, {00}, {00}, {00}, {ENDCHAR}},
{{STARTCHAR, numbersign}, {ENCODING, 35}, {SWIDTH, 1000, 0},
{DWIDTH, 8, 0}, {BBX, 8, 10, 0, -3}, {BITMAP}, {28}, {28},
{7c}, {28}, {7c}, {28}, {28}, {00}, {00}, {00}, {ENDCHAR}},
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 {BBX, 8, 10, 0, -3}, {BITMAP}, {20}, {10}, {08}, {08}, {08}, {10}, {20},
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 {00}, {28}, {10}, {7c}, {10}, {28}, {00}, {00}, {00}, {ENDCHAR}},
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{10}, {7c}, {10}, {10}, {10}, {08}, {00}, {00}, {00}, {ENDCHAR}},
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{BBX, 8, 10, 0, -3}, {BITMAP}, {00}, {00}, {44}, {44}, {44}, {44},
{38}, {00}, {00}, {00}, {ENDCHAR}}, {{STARTCHAR, v}, {ENCODING, 118},
{SWIDTH, 1000, 0}, {DWIDTH, 8, 0}, {BBX, 8, 10, 0, -3}, {BITMAP}, {00},
{00}, {44}, {44}, {44}, {28}, {10}, {00}, {00}, {00}, {ENDCHAR}},
{{STARTCHAR, w}, {ENCODING, 119}, {SWIDTH, 1000, 0}, {DWIDTH, 8, 0},
{BBX, 8, 10, 0, -3}, {BITMAP}, {00}, {00}, {54}, {54}, {54}, {54},
{28}, {00}, {00}, {00}, {ENDCHAR}}, {{STARTCHAR, x}, {ENCODING, 120},
{SWIDTH, 1000, 0}, {DWIDTH, 8, 0}, {BBX, 8, 10, 0, -3}, {BITMAP}, {00},
{00}, {44}, {28}, {10}, {28}, {44}, {00}, {00}, {00}, {ENDCHAR}},
{{STARTCHAR, y}, {ENCODING, 121}, {SWIDTH, 1000, 0}, {DWIDTH, 8, 0},
{BBX, 8, 10, 0, -3}, {BITMAP}, {00}, {00}, {44}, {44}, {44}, {44},
{3c}, {04}, {78}, {00}, {ENDCHAR}}, {{STARTCHAR, z}, {ENCODING, 122},
{SWIDTH, 1000, 0}, {DWIDTH, 8, 0}, {BBX, 8, 10, 0, -3}, {BITMAP}, {00},
{00}, {7c}, {08}, {10}, {20}, {7c}, {00}, {00}, {00}, {ENDCHAR}},
{{STARTCHAR, braceleft}, {ENCODING, 123}, {SWIDTH, 1000, 0},
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{10}, {20}, {10}, {10}, {08}, {00}, {00}, {00}, {ENDCHAR}},
{{STARTCHAR, bar}, {ENCODING, 124}, {SWIDTH, 1000, 0},
{DWIDTH, 8, 0}, {BBX, 8, 10, 0, -3}, {BITMAP}, {10}, {10},
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{{STARTCHAR, braceright}, {ENCODING, 125}, {SWIDTH, 1000, 0},
{DWIDTH, 8, 0}, {BBX, 8, 10, 0, -3}, {BITMAP}, {20}, {10},
{10}, {08}, {10}, {10}, {20}, {00}, {00}, {00}, {ENDCHAR}},
{{STARTCHAR, asciitilde}, {ENCODING, 126}, {SWIDTH, 1000, 0},
{DWIDTH, 8, 0}, {BBX, 8, 10, 0, -3}, {BITMAP}, {00}, {00},
{20}, {54}, {08}, {00}, {00}, {00}, {00}, {00}, {00}, {ENDCHAR}}}

```

In[10]:= **charlines**[[1]]

```

Out[10]= {{STARTCHAR, space}, {ENCODING, 32}, {SWIDTH, 1000, 0},
{DWIDTH, 8, 0}, {BBX, 8, 10, 0, -3}, {BITMAP}, {00}, {00},
{00}, {00}, {00}, {00}, {00}, {00}, {ENDCHAR}}

```

In[11]:= **charlines**[[2]]

```

Out[11]= {{STARTCHAR, exclam}, {ENCODING, 33}, {SWIDTH, 1000, 0},
{DWIDTH, 8, 0}, {BBX, 8, 10, 0, -3}, {BITMAP}, {10}, {10},
{10}, {10}, {10}, {00}, {10}, {00}, {00}, {00}, {ENDCHAR}}

```

```
In[12]:= charcodes = Last[Flatten[Select[#, First[#] == "ENCODING" &]]] & /@ charlines
```

```
Out[12]= {32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53,
54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73,
74, 75, 76, 77, 78, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93,
94, 95, 96, 97, 98, 99, 100, 101, 102, 103, 104, 105, 106, 107, 108, 109, 110,
111, 112, 113, 114, 115, 116, 117, 118, 119, 120, 121, 122, 123, 124, 125, 126}
```

```
In[13]:= widths = Flatten[Select[#, First[#] == "DWIDTH" &]] [[2]] & /@ charlines
```

[illegible]

```
In[14]:= boundingboxes = Flatten[Select[#, First[#] == "BBX" &]] & /@ charlines
```

[illegible]

```
In[15]:= sizes = Take[#, {2, 3}] & /@ ToExpression[boundingBoxes]
Transpose[%];
maxsize = MapThread[Apply, {{Max, Max}, %}]
```

[illegible]

Out[17]= {8, 10}

```
In[18]:= bounds = Flatten[{Take[#, -2], Take[#, -2] + Take[#, {2, 3}]}] & /@
      ToExpression[boundingboxes]
Transpose[%];
bigbox = MapThread[Apply, {{Min, Min, Max, Max}, %}]
```

[illegible]

Out[20]= {0, -3, 8, 7}

```
In[21]:= fills = # - bigbox & /@ bounds;
```

```
In[22]:= fills[[1]]
```

```
Out[22]= {0, 0, 0, 0}
```

```
In[23]:= boundingboxes
```

[illegible]

```
In[24]:= bounds
```

[illegible]

```
In[25]:= bitmaps = Function[{line},
  Block[{bounds = ToExpression[Drop[Flatten[Select[line, First[#] == "BBX" &]], 1]]},
    1 - Take[HexExpand[#], bounds[[1]] & /@ Flatten[Take[line,
      {1, -1} + Flatten[Position[line, #] & /@ {"BITMAP"}, {"ENDCHAR"}]]]]
  ]
] /@ charlines
```

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]


```

{1, 1, 1, 1, 1, 1, 1, 1}, {1, 1, 1, 1, 1, 1, 1, 1}, {1, 1, 1, 1, 1, 1, 1, 1}},
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{1, 1, 1, 0, 1, 1, 1, 1}, {1, 1, 1, 0, 1, 1, 1, 1}, {1, 1, 1, 0, 1, 1, 1, 1},
{1, 1, 1, 1, 0, 1, 1, 1}, {1, 1, 1, 1, 1, 1, 1, 1}, {1, 1, 1, 1, 1, 1, 1, 1},
{1, 1, 1, 1, 1, 1, 1, 1}}, {{1, 1, 1, 1, 1, 1, 1, 1},
{1, 1, 1, 1, 1, 1, 1, 1}, {1, 0, 1, 1, 1, 0, 1, 1}, {1, 0, 1, 1, 1, 0, 1, 1},
{1, 0, 1, 1, 1, 0, 1, 1}, {1, 0, 1, 1, 1, 0, 1, 1}, {1, 1, 0, 0, 0, 1, 1, 1},
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{1, 1, 1, 1, 1, 1, 1, 1}, {1, 1, 1, 1, 1, 1, 1, 1}, {1, 1, 1, 1, 1, 1, 1, 1}},
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{1, 1, 1, 1, 1, 1, 1, 1}, {1, 1, 1, 1, 1, 1, 1, 1}, {1, 1, 1, 1, 1, 1, 1, 1}},
{{1, 1, 1, 1, 1, 1, 1, 1}, {1, 1, 1, 1, 1, 1, 1, 1}, {1, 1, 1, 1, 1, 1, 1, 1},
{1, 1, 1, 1, 1, 1, 1, 1}, {1, 1, 1, 1, 1, 1, 1, 1}, {1, 1, 1, 1, 1, 1, 1, 1},
{1, 1, 1, 1, 1, 1, 1, 1}, {1, 1, 1, 1, 1, 1, 1, 1}, {1, 1, 1, 1, 1, 1, 1, 1}}

```

```

In[26]:= BitmapExtend = Function[{bitmap, fill},
  Block[{bmp, xl = Table[1, {0, fill[[1]}], xr = Table[1, {0, -fill[[3]}], yt, yb},
    bmp = Join[xl, #, xr] & /@ bitmap;
    yb = Table[Table[1, {0, Length[First[bmp]}], {0, fill[[2]}];
    yt = Table[Table[1, {0, Length[First[bmp]}], {0, -fill[[4]}];
    Join[yt, bmp, yb]
  ]
]

```

```

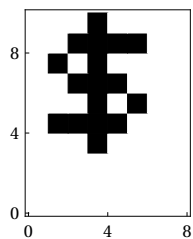
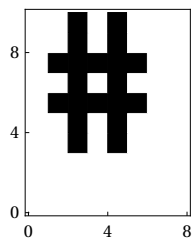
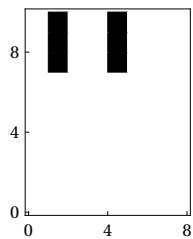
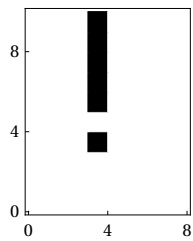
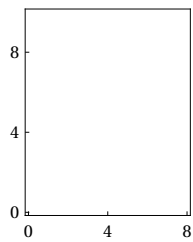
Out[26]= Function[{bitmap, fill},
  Block[{bmp, xl = Table[1, {0, fill[[1]]}], xr = Table[1, {0, -fill[[3]]}], yt, yb},
    bmp = (Join[xl, #1, xr] &) /@ bitmap;
    yb = Table[Table[1, {0, Length[First[bmp]]}], {0, fill[[2]]}];
    yt = Table[Table[1, {0, Length[First[bmp]]}], {0, -fill[[4]]}];
    Join[yt, bmp, yb]]]

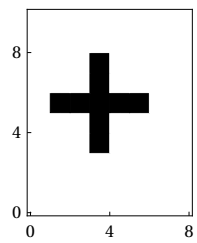
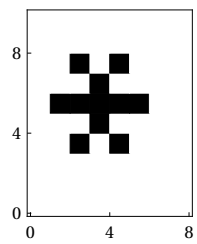
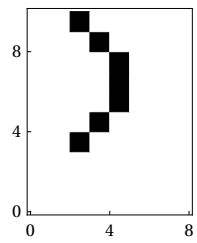
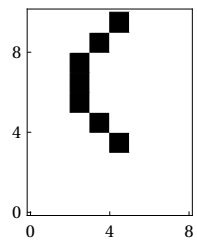
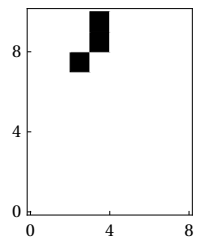
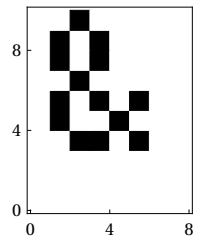
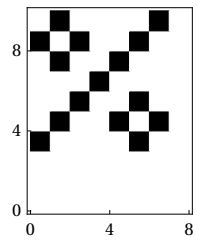
In[27]:= extbitmaps = MapThread[BitmapExtend, {bitmaps, fills}];

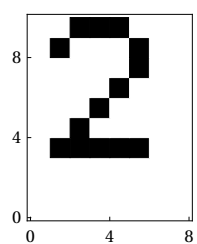
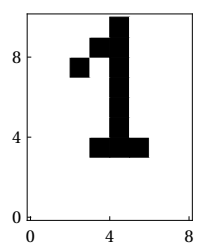
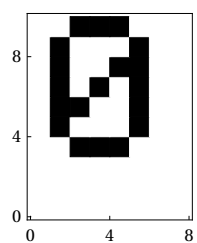
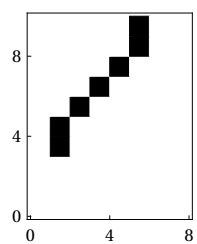
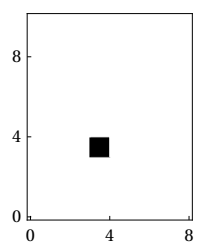
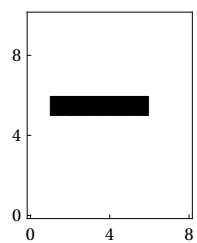
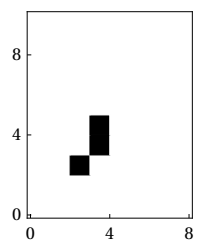
In[28]:= Graphics[Raster[Reverse[#]], Frame → True, AspectRatio → Divide@@Dimensions[#],
  FrameTicks → ({#, #, {}}, {}) &[Range[0, 16, 4]]] & /@ extbitmaps;

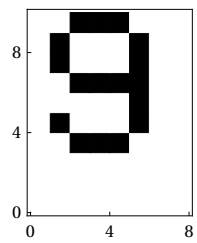
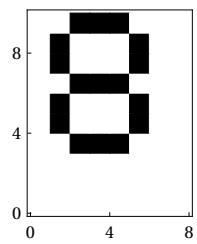
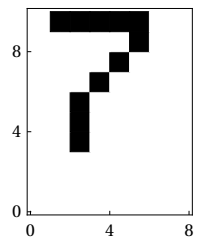
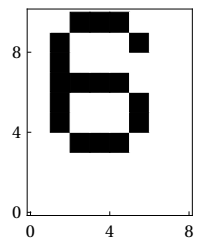
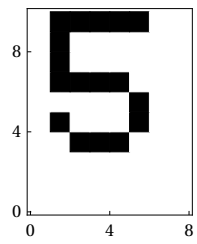
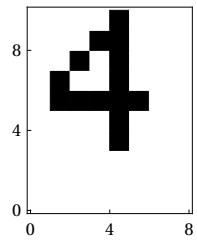
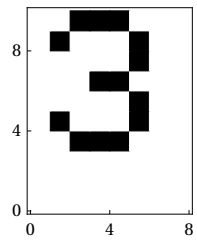
Print /@
  %;

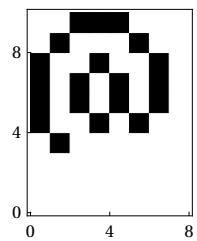
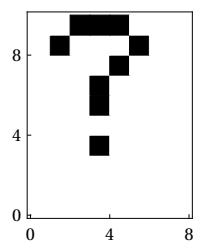
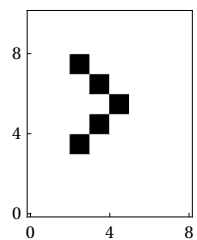
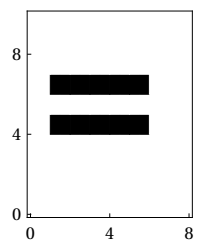
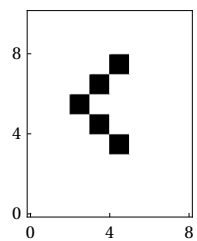
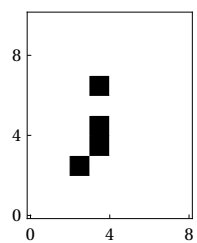
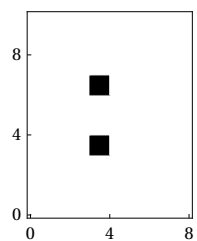
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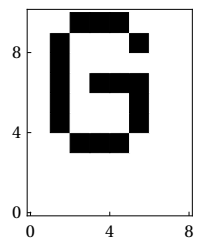
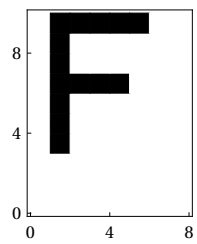
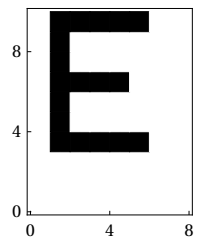
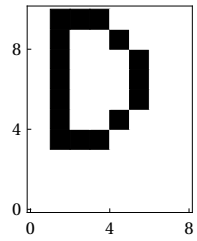
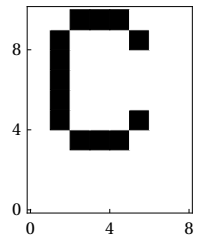
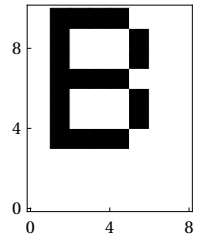
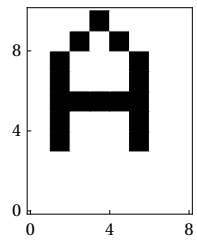


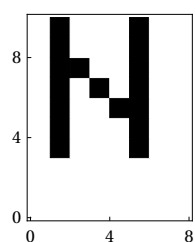
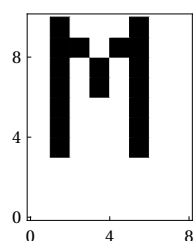
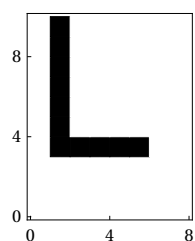
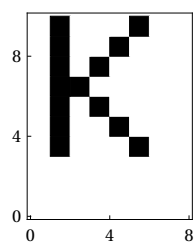
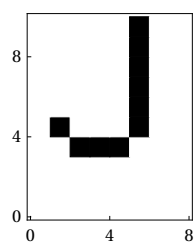
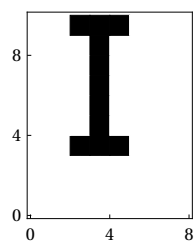
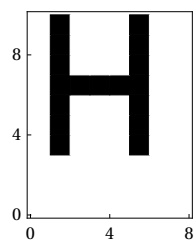


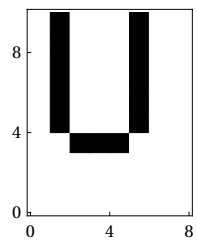
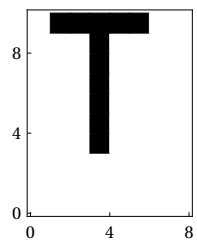
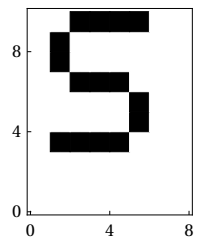
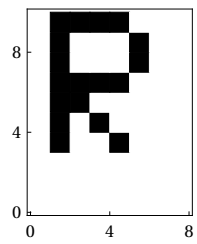
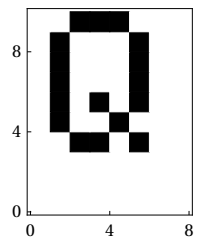
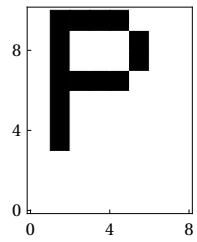
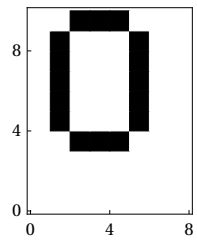


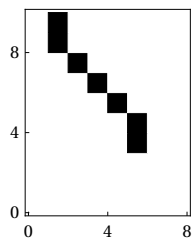
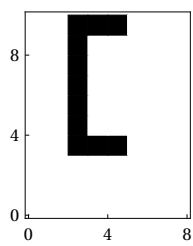
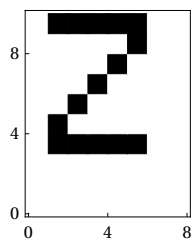
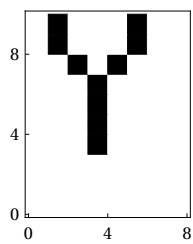
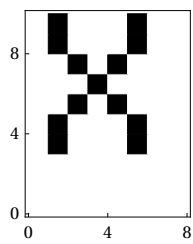
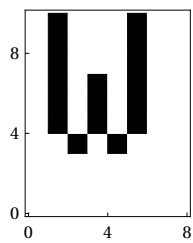
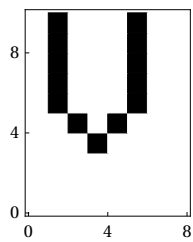


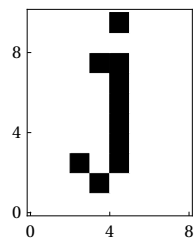
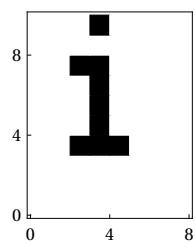
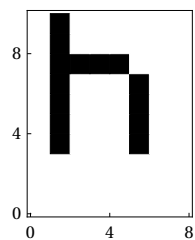
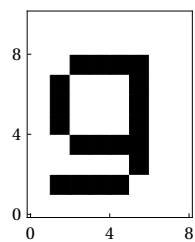
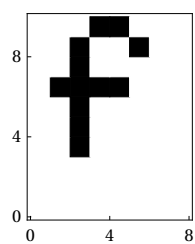
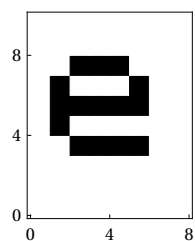
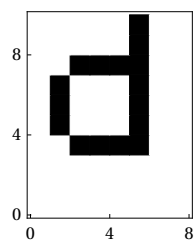


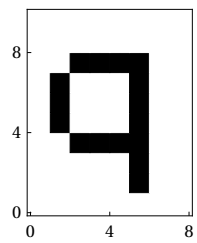
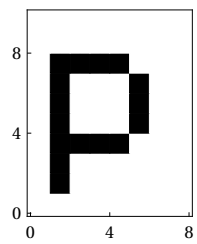
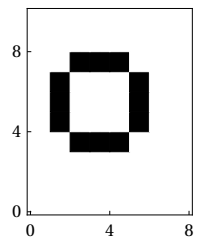
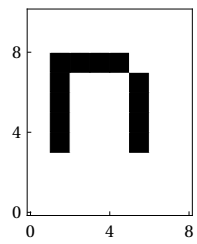
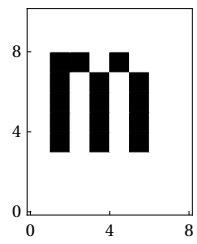
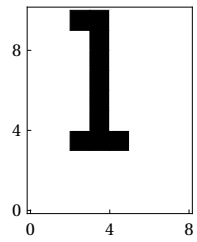
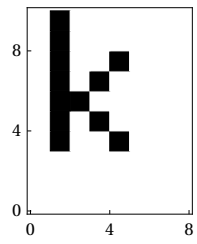


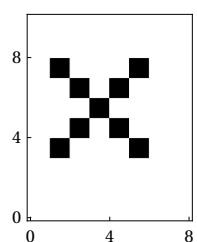
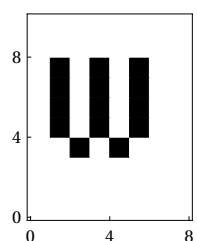
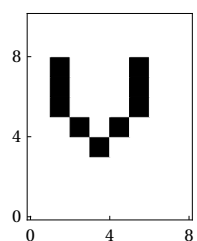
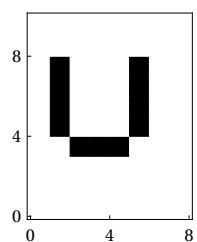
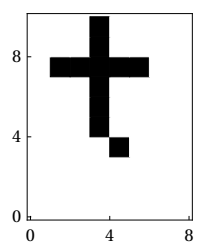
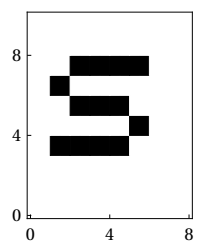
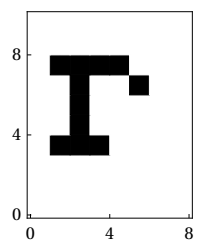


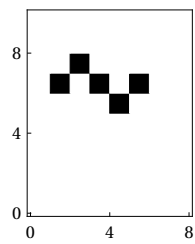
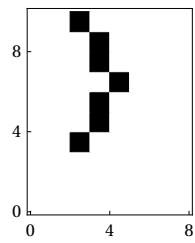
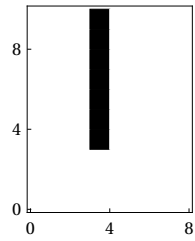
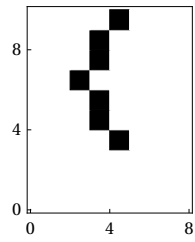
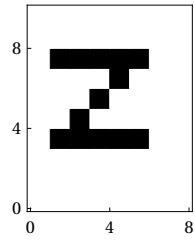
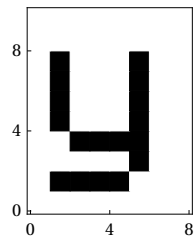












In[30]:= **Dimensions**[extbitmaps]

Out[30]= { 95, 10, 8 }

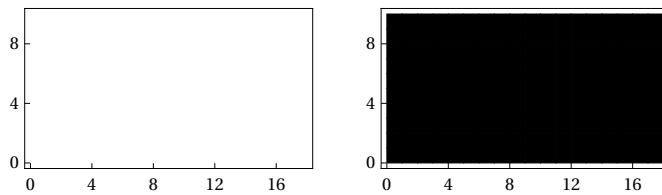
AT320240

```
In[31]:= AT320240bitmaps =
  {#, 1 - #} & [Reverse[BitmapExtend[#, {0, 0, -10, 0}]]] & /@ extbitmaps;
Dimensions[AT320240bitmaps]
```

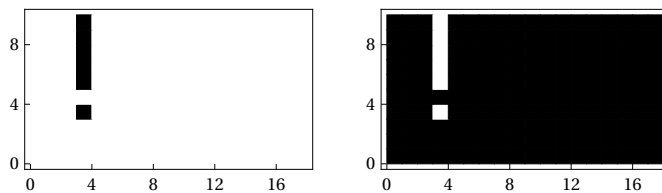
```
Out[32]:= {95, 2, 10, 18}
```

```
In[33]:= Map[Graphics[Raster[#], Frame → True, AspectRatio → Divide @@ Dimensions[#],
  FrameTicks → ({#, #, {}}, {{}} & [Range[0, 16, 4]])] &, AT320240bitmaps, {2}];
Print[GraphicsArray[#]] & /@ %;
```

... **GraphicsArray**: GraphicsArray is obsolete. Switching to GraphicsGrid.

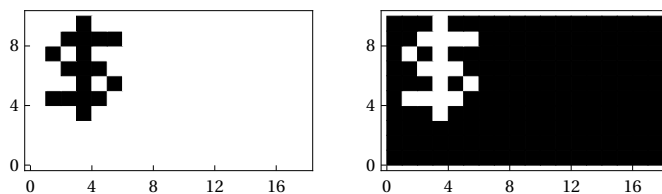
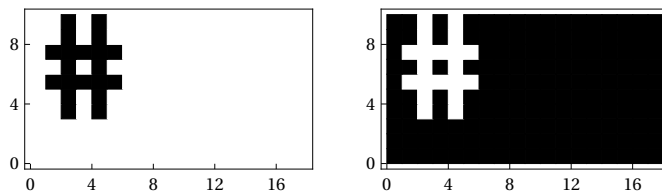
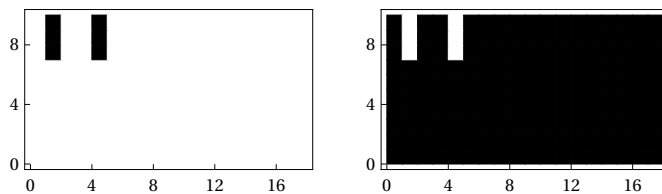


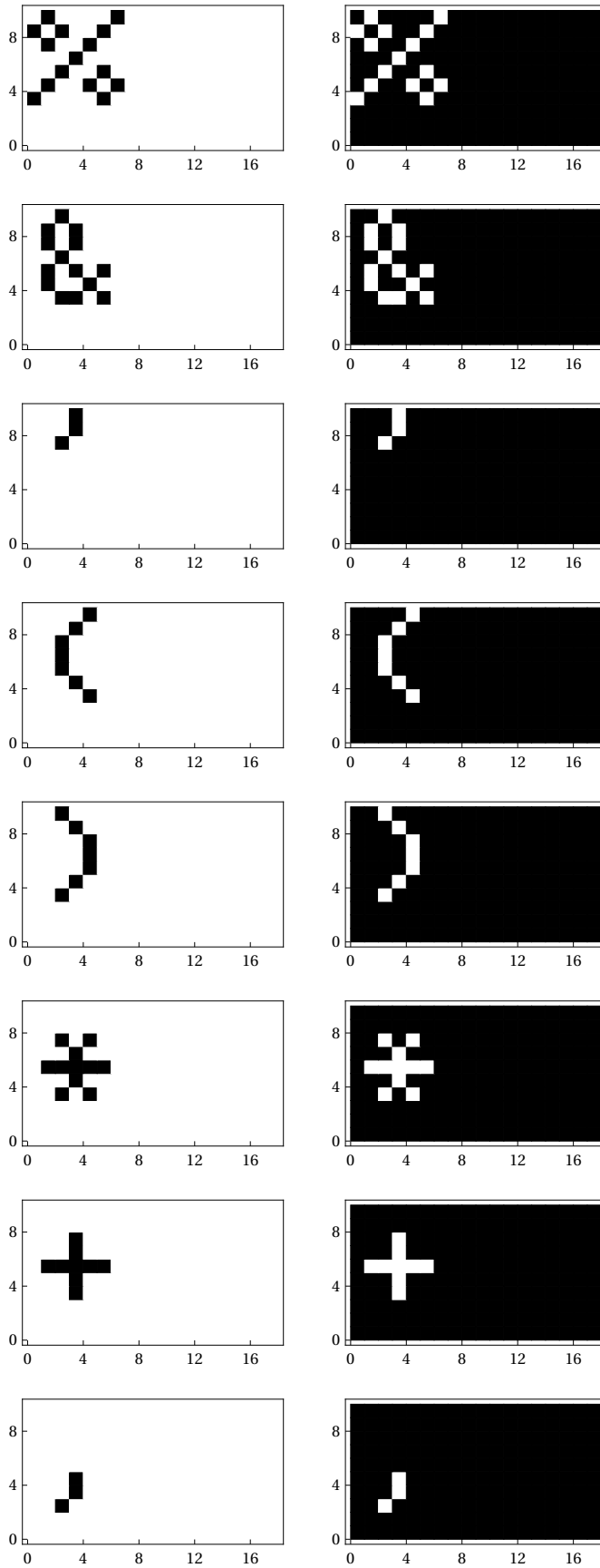
... **GraphicsArray**: GraphicsArray is obsolete. Switching to GraphicsGrid.

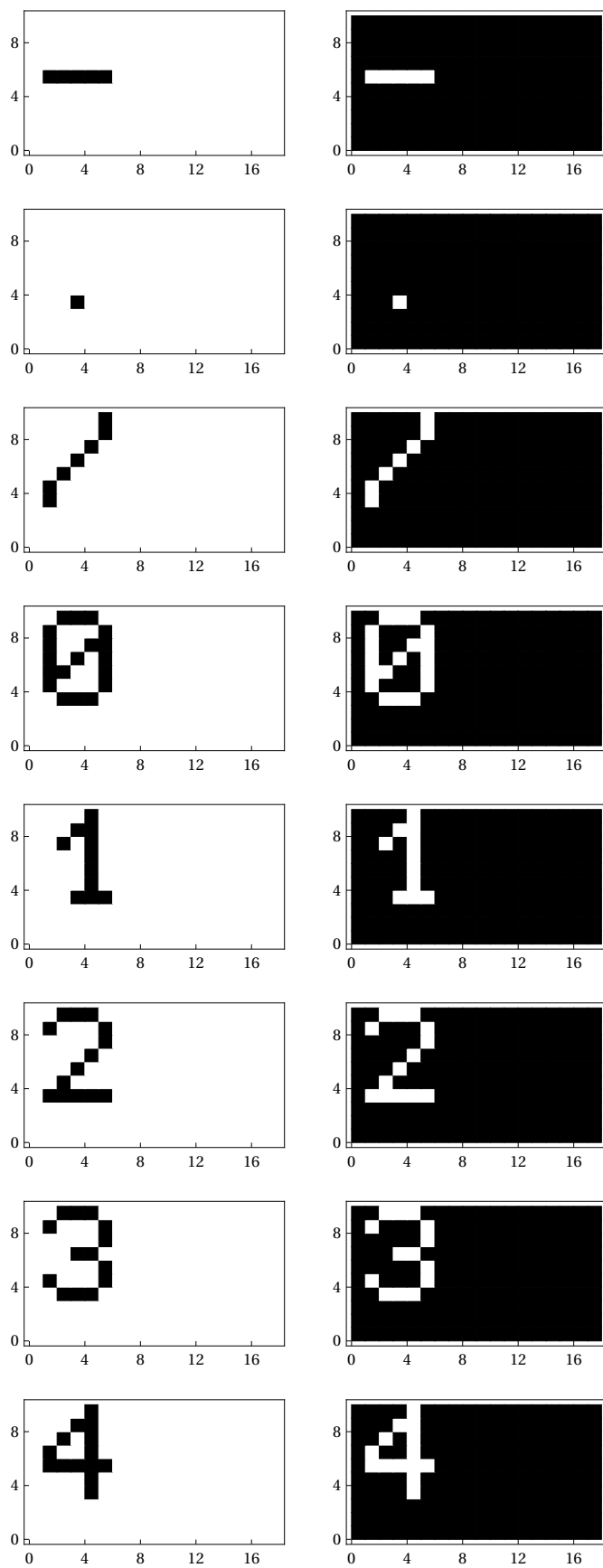


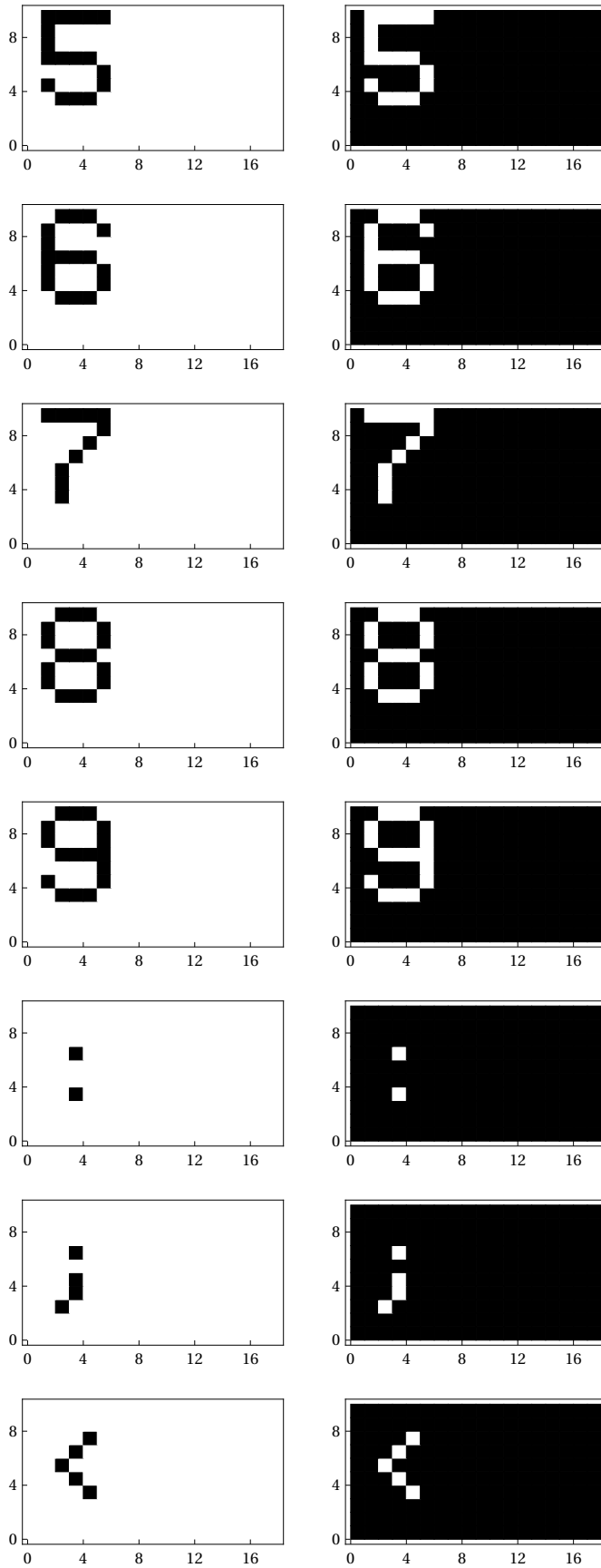
... **GraphicsArray**: GraphicsArray is obsolete. Switching to GraphicsGrid.

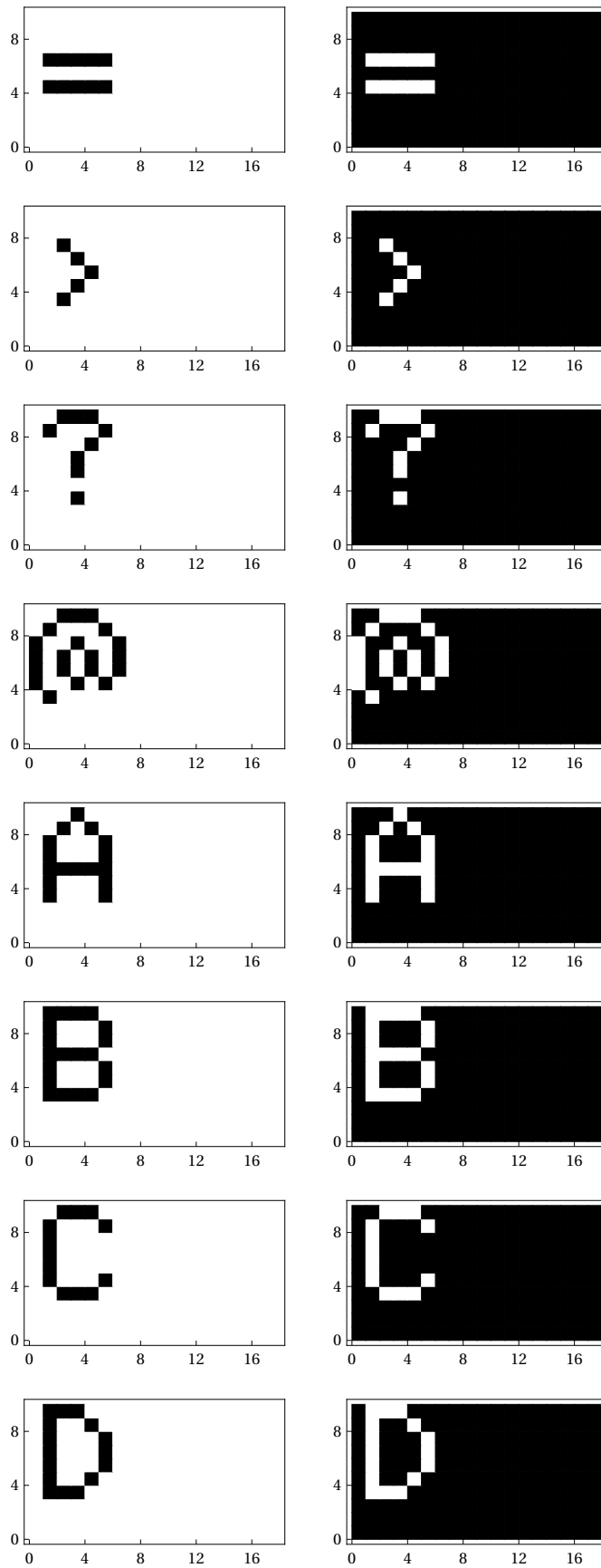
... **General**: Further output of GraphicsArray::obs will be suppressed during this calculation.

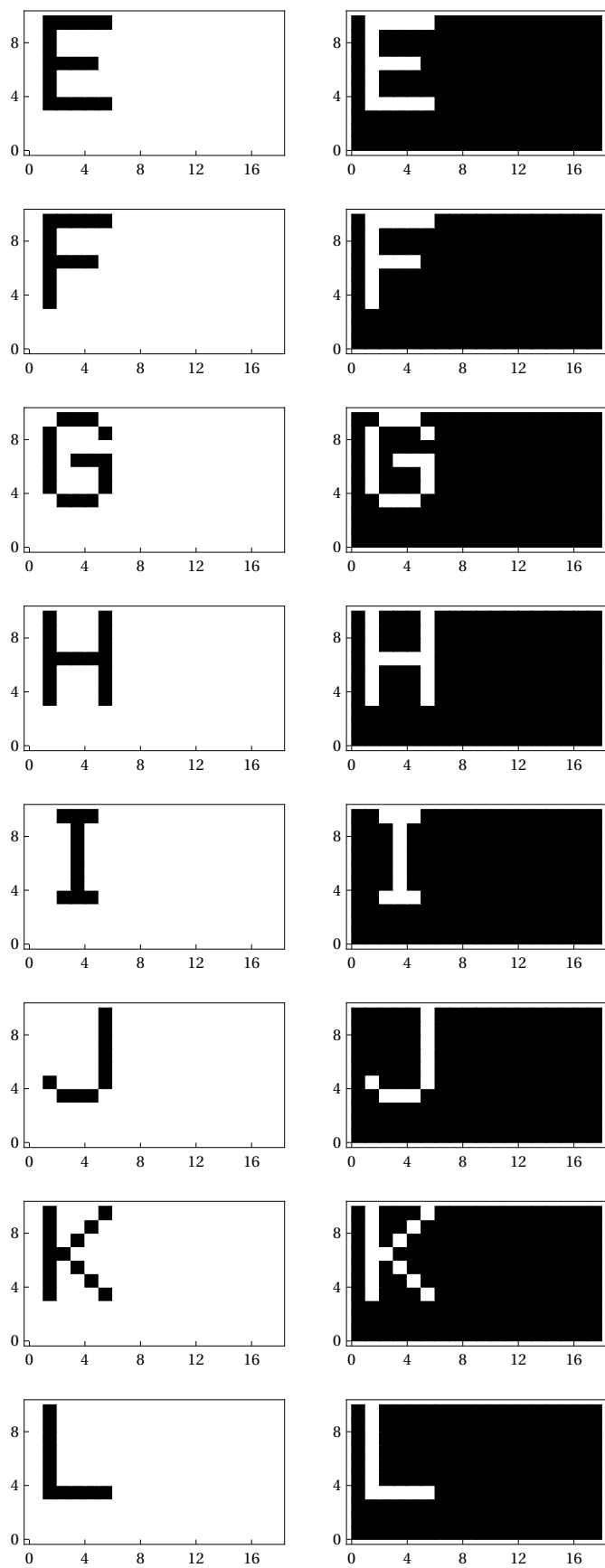


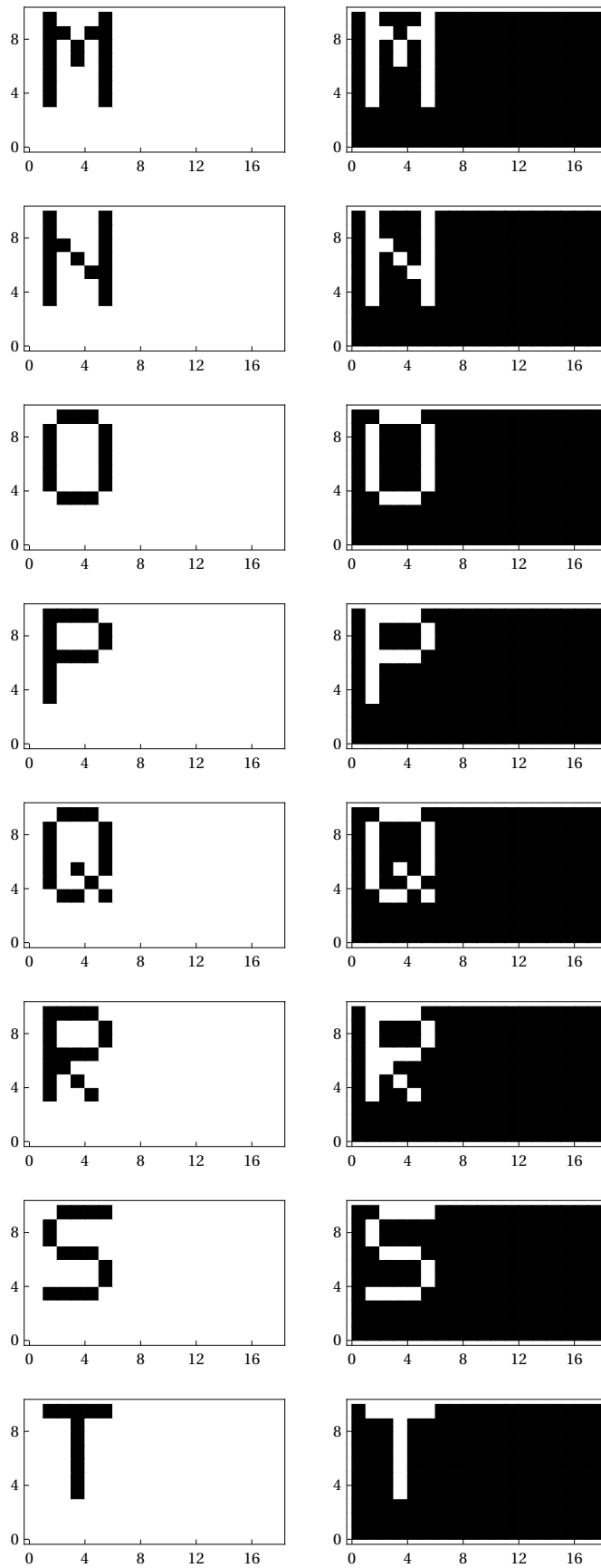


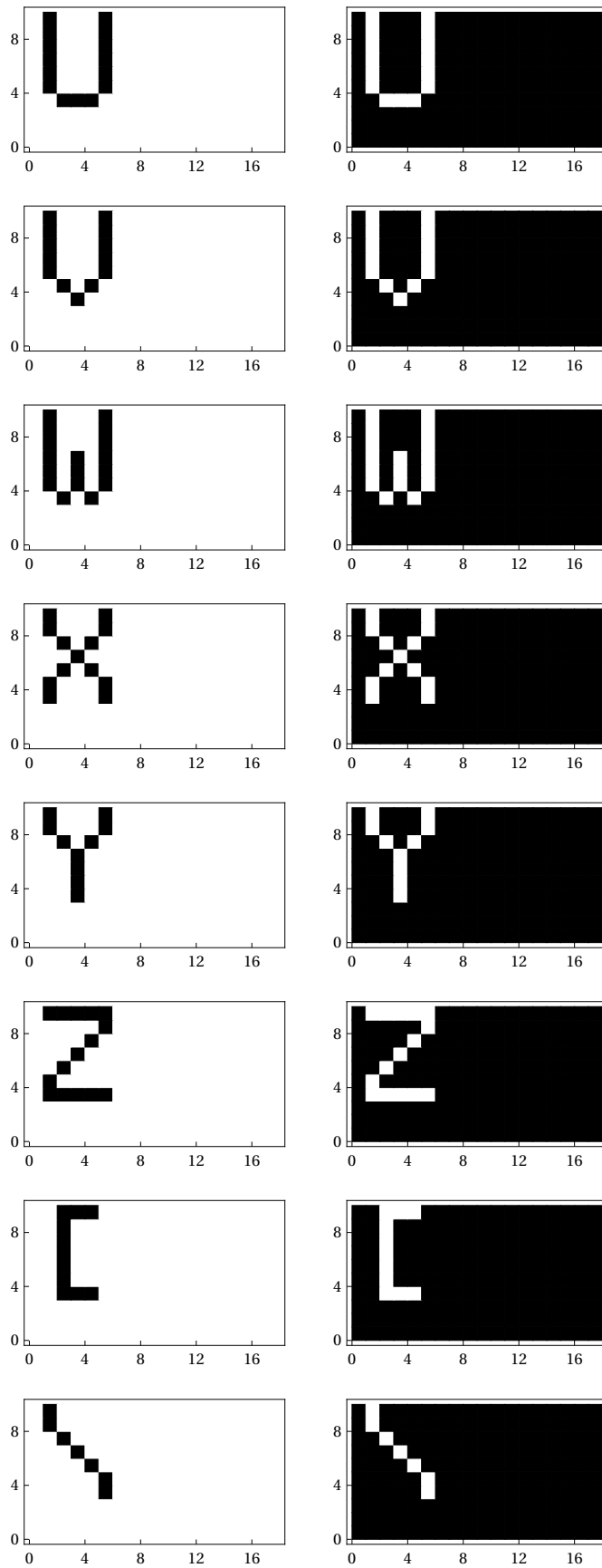


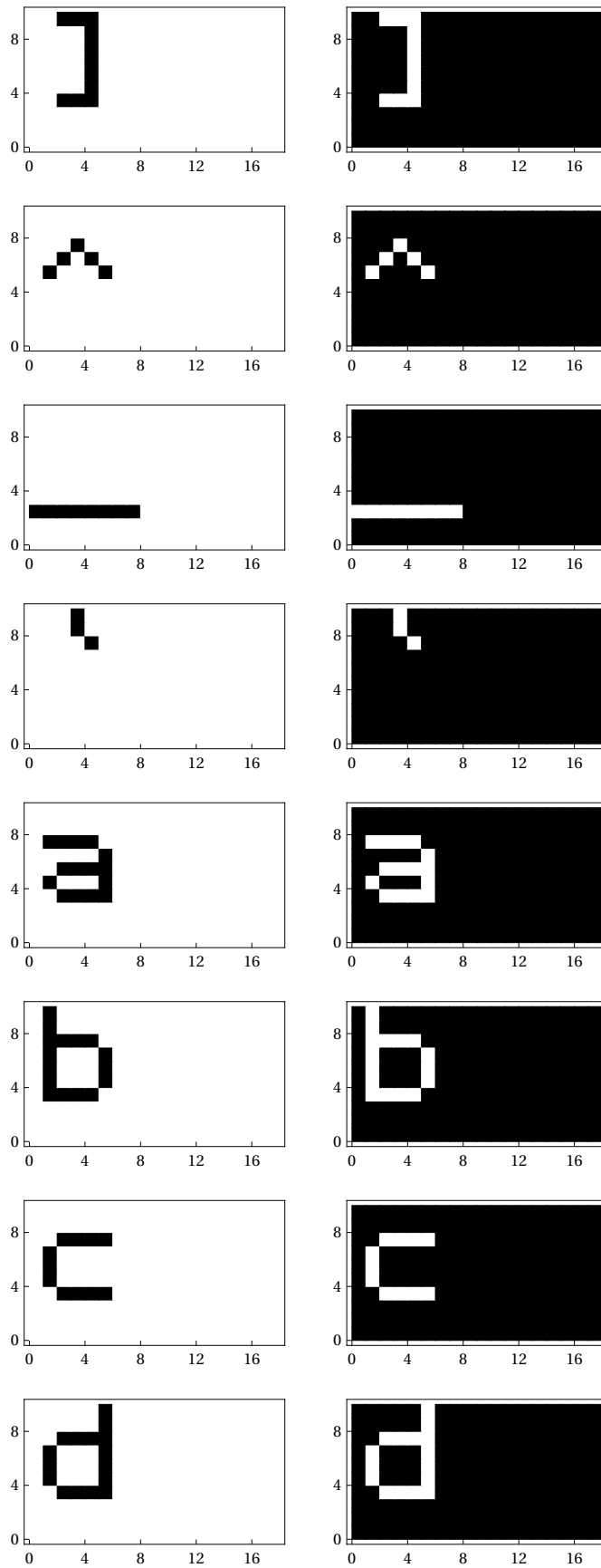


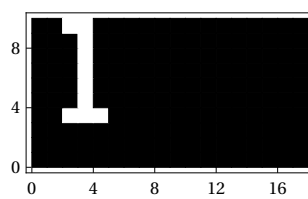
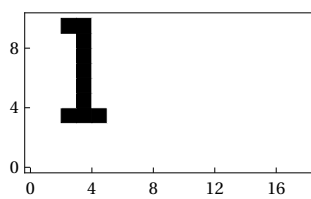
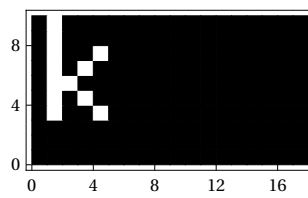
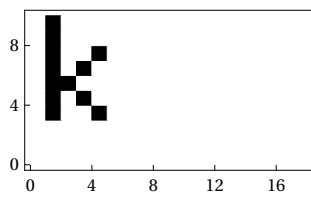
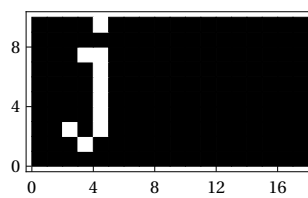
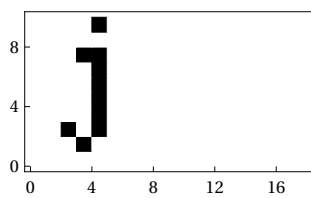
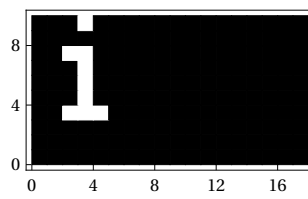
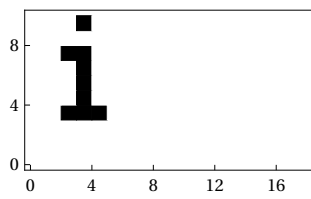
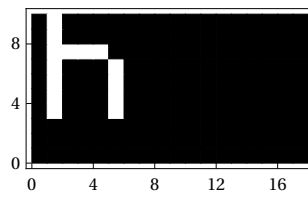
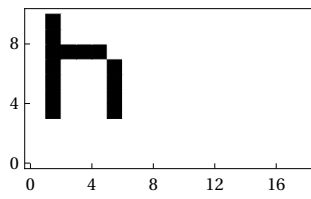
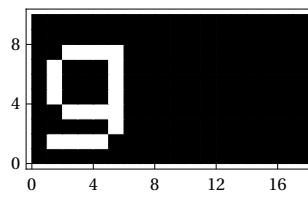
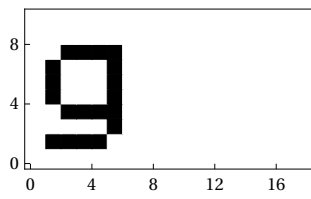
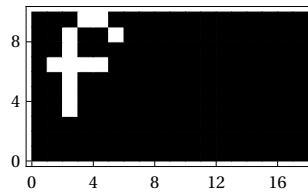
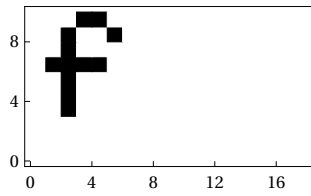
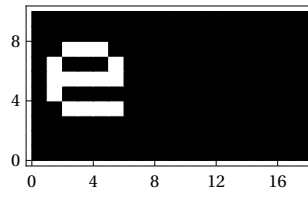
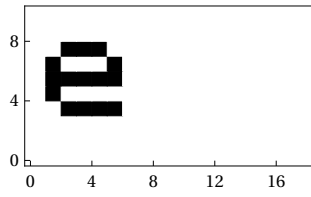


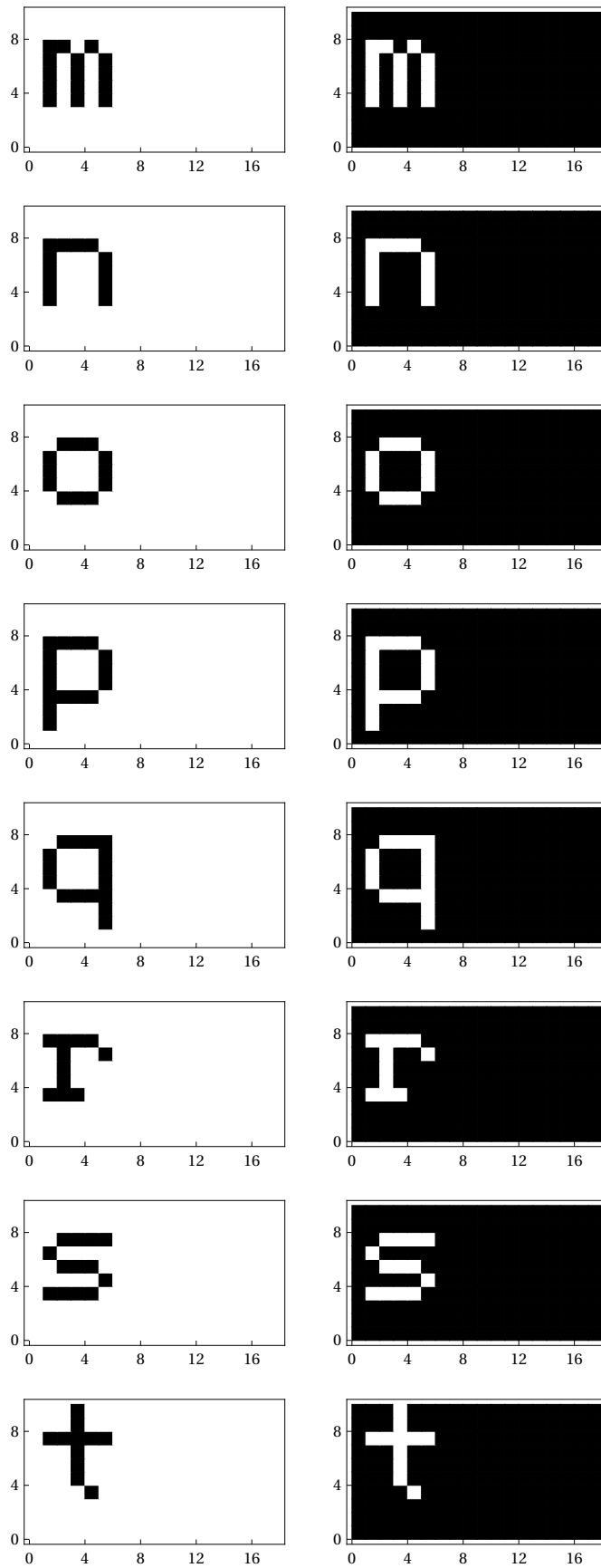


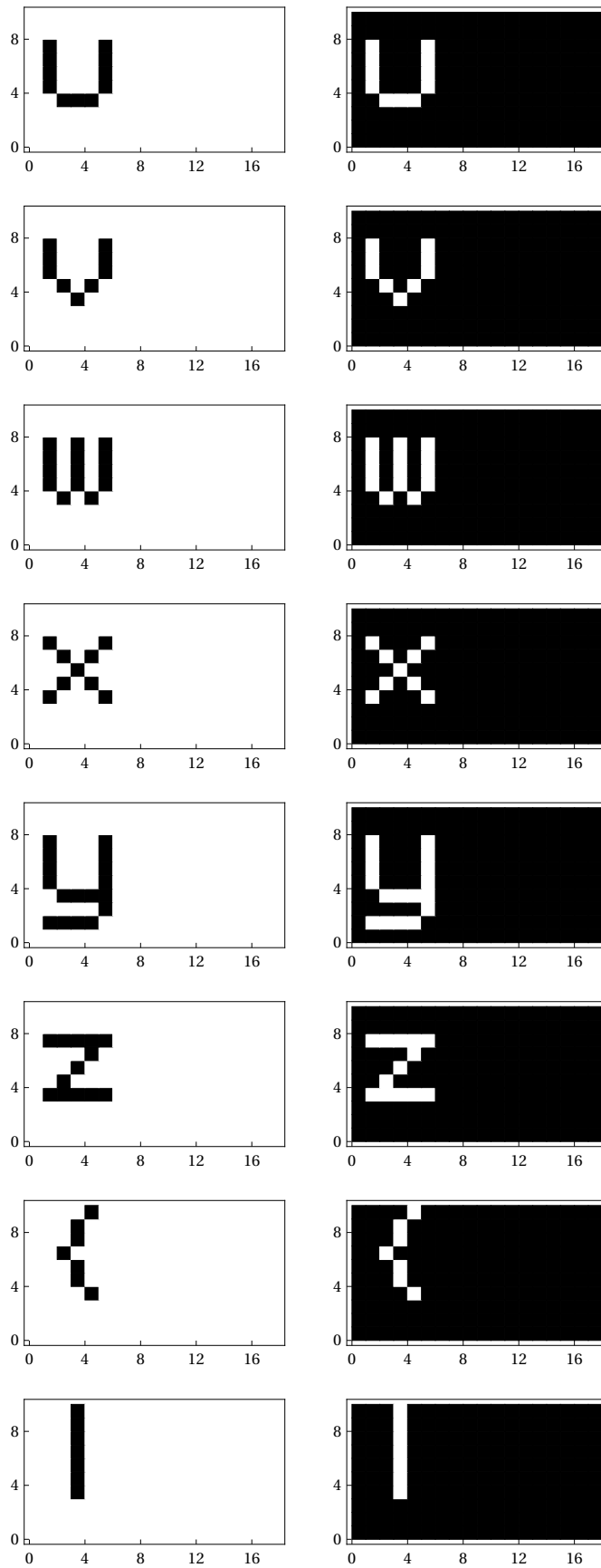


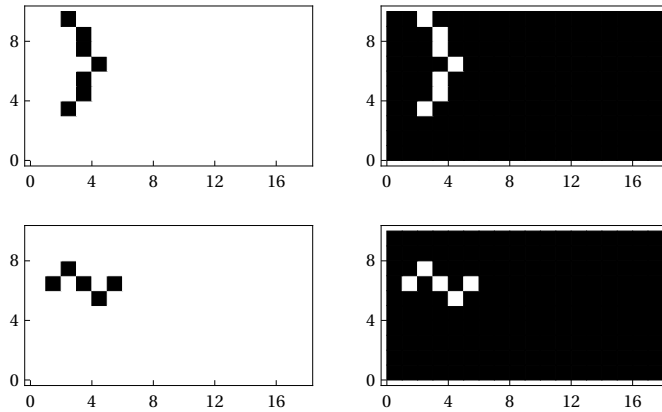












```
In[35]:= outputbitmasks = Map[WordBuild, AT320240bitmaps, {-2}];
outputcharsize = MapThread[{Length[First[#1]], #2} &, {AT320240bitmaps, widths}];
outputcharacters = MapThread[Flatten[{#2, #1}] &, {outputbitmasks, outputcharsize}];
Dimensions[outputcharacters]
```

```
Out[38]= {95, 22}
```

■ Organize the font as one contiguous file

```
In[39]:= offsets = Drop[FoldList[Plus, 0, Length /@ outputcharacters], -1];
In[40]:= TableForm[Join[{"const lcd_primitive experimentalfont[]=", "{"},
{"\texperimentalfont_addr + "<> ToString[#] <> "," & /@ offsets), {"};"}}}]]
Export["experimentalfont.c.snippet", %, "Lines"]
```

```
Out[40]//TableForm=
```

```
const lcd_primitive experimentalfont[] =
{
    experimentalfont_addr + 0,
    experimentalfont_addr + 22,
    experimentalfont_addr + 44,
    experimentalfont_addr + 66,
    experimentalfont_addr + 88,
    experimentalfont_addr + 110,
    experimentalfont_addr + 132,
    experimentalfont_addr + 154,
    experimentalfont_addr + 176,
    experimentalfont_addr + 198,
    experimentalfont_addr + 220,
    experimentalfont_addr + 242,
    experimentalfont_addr + 264,
    experimentalfont_addr + 286,
    experimentalfont_addr + 308,
    experimentalfont_addr + 330,
    experimentalfont_addr + 352,
    experimentalfont_addr + 374,
    experimentalfont_addr + 396,
    experimentalfont_addr + 418,
    experimentalfont_addr + 440,
    experimentalfont_addr + 462,
    experimentalfont_addr + 484,
    experimentalfont_addr + 506,
    experimentalfont_addr + 528,
    experimentalfont_addr + 550,
    experimentalfont_addr + 572,
    experimentalfont_addr + 594,
    experimentalfont_addr + 616,
    experimentalfont_addr + 638,
    experimentalfont_addr + 660,
    experimentalfont_addr + 682,
```



```

experimentalfont_addr + 704,
experimentalfont_addr + 726,
experimentalfont_addr + 748,
experimentalfont_addr + 770,
experimentalfont_addr + 792,
experimentalfont_addr + 814,
experimentalfont_addr + 836,
experimentalfont_addr + 858,
experimentalfont_addr + 880,
experimentalfont_addr + 902,
experimentalfont_addr + 924,
experimentalfont_addr + 946,
experimentalfont_addr + 968,
experimentalfont_addr + 990,
experimentalfont_addr + 1012,
experimentalfont_addr + 1034,
experimentalfont_addr + 1056,
experimentalfont_addr + 1078,
experimentalfont_addr + 1100,
experimentalfont_addr + 1122,
experimentalfont_addr + 1144,
experimentalfont_addr + 1166,
experimentalfont_addr + 1188,
experimentalfont_addr + 1210,
experimentalfont_addr + 1232,
experimentalfont_addr + 1254,
experimentalfont_addr + 1276,
experimentalfont_addr + 1298,
experimentalfont_addr + 1320,
experimentalfont_addr + 1342,
experimentalfont_addr + 1364,
experimentalfont_addr + 1386,
experimentalfont_addr + 1408,
experimentalfont_addr + 1430,
experimentalfont_addr + 1452,
experimentalfont_addr + 1474,
experimentalfont_addr + 1496,
experimentalfont_addr + 1518,
experimentalfont_addr + 1540,
experimentalfont_addr + 1562,
experimentalfont_addr + 1584,
experimentalfont_addr + 1606,
experimentalfont_addr + 1628,
experimentalfont_addr + 1650,
experimentalfont_addr + 1672,
experimentalfont_addr + 1694,
experimentalfont_addr + 1716,
experimentalfont_addr + 1738,
experimentalfont_addr + 1760,
experimentalfont_addr + 1782,
experimentalfont_addr + 1804,
experimentalfont_addr + 1826,
experimentalfont_addr + 1848,
experimentalfont_addr + 1870,
experimentalfont_addr + 1892,
experimentalfont_addr + 1914,
experimentalfont_addr + 1936,
experimentalfont_addr + 1958,
experimentalfont_addr + 1980,
experimentalfont_addr + 2002,
experimentalfont_addr + 2024,
experimentalfont_addr + 2046,
experimentalfont_addr + 2068,
};

```

Out[41]= experimentalfont.c.snippet

■ Send data function

```

In[42]:= SaveCharacterFile = Function[{filename, data},
  Block[{stream = OpenWrite[filename], headertemplate = "1651 1 0 1 "},
    Write[stream, OutputForm[#]] & /@
    Prepend["0x" <> StringSplit[ToString[BaseForm[#, 16]]][[1]] & /@ data,
    headertemplate <> ToString[Length[data]]];
    Close[stream]]
]

Out[42]= Function[{filename, data},
  Block[{stream = OpenWrite[filename], headertemplate = 1651 1 0 1 },
    (Write[stream, #1] &) /@ Prepend[(0x <> StringSplit[ToString[Slot[1_16]]][[1]] &) /@
    data, headertemplate <> ToString[Length[data]]];
    Close[stream]]]

In[43]:= SaveCharacterFile["experimentalfont.dat2", Flatten[outputcharacters]];

```