Embedded DynaFont General Catalog

Scalable Outline Font For Embedded Devices
• DigiType Font

Versatile Font For Embedded Devices
• Bitmap Font • Gray Bitmap Font • TrueType Font

Multilingual Font
• DigiType Font • Bitmap Font • TrueType Font
DigiType Font

DigiType is a proprietary scalable font that was developed particularly for embedded systems to optimize drawing quality and speed.

### Introduction

**Stroke-Based Font**

DigiType Font is developed from the patented Stroke-Based technology, which can significantly minimize font data size while maintaining high quality scalable outline. DigiType is most suitable for high resolution, multi-functional devices with limited memory space.

### Rendering Image

**Software Rasterizing (rendering)**

Application → Rendering → DigiType API (Arabic / Thai / Hindi / Hebrew / Vietnamese Layout Engine) → Font Rasterizer → Display (LCD)

**Hardware Rasterizing (by OpenVG)**

Application → Instruction to render → DigiType API (Arabic / Thai / Hindi / Hebrew / Vietnamese Layout Engine) → Font Converter → Display (LCD)

### Revising Function & Decorative Function

**Hinting Function**

- Stem Loss Hinting
- Dropout Control Hinting
- Grid Fitting

**Rasterizer Revising Function**

- Reduce shades of gradation
- Adjust stroke positions
- Adjust stroke colors

**Small Size Revising Function (option)**

- Strokes Reducing Hinting Technology

**Anti-Alias Function (Smoothing Function)**

- 4, 16, and 256 shades of gray

**Decorative Function**

- Width
- Height
- Bold
- Rotation
- Vertically Condensed
- Horizontally Condensed

The Strokes Reducing Hinting technology developed by DynaComware reduces or moves the appropriate strokes when rendering Chinese characters with complex strokes, which makes small print clearly readable. By this technology, the legibility of the small print is enhanced without affecting character recognition.
Other Features and Functions

- Chinese national character standard, or GB18030 (License certificate will be issued by NITS)

- DigiType Plug-in for FreeType Engine
  - China National Information Technology Standardization Technical Committee (NITS)
  - License agreement
  - License certificate with your company
  - User
  - FreeType Library
  - DigiType Library
  - TrueType Font
  - TrueType Font
  - DigiType Font

- Universal Design Font
  
- Screen Font

Font Description Language (FDL)

To embed DigiType Font into your environment, both font data and rasterizer (render) are needed. We will provide rasterizer compiled library according to the CPU.

DigiType Font can be used in various embedded devices with high clock rate CPU such as appliances (DTV, STB, Digital camera, video camera), automotive products (car navigation, car audio, instrument panel), and multi-function printer.

Structure of DigiType Font

- OS (Linux, Windows CE…)
  - Font Application
  - DigiType Font Engine (OS Independent)
    - Hinting-Interpreter
      - Grid-fitting
      - Glyph Outline
    - Sub-Pixels Filter
    - Anti-Aliasing
      - Scan Converter
    - Font data

Standard Work Flow

- Construction of compiling environment of each CPU, OS
- Set up build environment
- Carry out compiling
- Create library
**Font Specification**

- **CPU**: Independent
- **OS**: Independent
- **Programming Language**: C
- **Library Size**: [Shared Library] 260KB [Basic Library] 150KB
- **Working Memory**: [Shared Library] 256KB [Basic Library] 120KB

- **[Advanced Library]**
  - Support 41 languages
  - Support hardware acceleration
  - Support Layout Engine

- **[Basic Library]**
  - Support software rendering only

**Font Data Size**

<table>
<thead>
<tr>
<th>Language</th>
<th>Standard</th>
<th>Font Data Size (DigType)</th>
<th>Font Data Size (Truetype)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Japanese</td>
<td>JIS-X0208, X0201</td>
<td>~ 650KB</td>
<td>~ 2,300KB</td>
</tr>
<tr>
<td>Chinese (Simplified)</td>
<td>GB18030</td>
<td>~ 2,400KB</td>
<td>~ 8,000KB</td>
</tr>
<tr>
<td>Chinese (Traditional)</td>
<td>Big5</td>
<td>~ 1,100KB</td>
<td>~ 7,300KB</td>
</tr>
<tr>
<td>Chinese (Hong Kong)</td>
<td>Big5+HKSCS</td>
<td>~ 1,500KB</td>
<td>~ 9,700KB</td>
</tr>
<tr>
<td>Korean</td>
<td>KSX1001</td>
<td>~ 740KB</td>
<td>~ 2,300KB</td>
</tr>
</tbody>
</table>

* Data Size can be reduced depending on user environment

**Font Layout Engine Specification**

### Font Layout Engine

- **Application Program**
  - Hindi
  - DCW Shaper
  - Hebrew
  - Arabic
  - Thai
  - Vietnamese

- **DCW Rasterizer**
- **FDL Font Rasterizer**

- **Font Data**

### Common API Specification of Font Layout Engine

- **CPU**: Independent
- **OS**: Independent
- **Programming Language**: C
- **Library Size**: Approx. 260KB (Common in Arabic / Thai / Hindi)
- **Working Memory**: Approx. 256KB (Common in Arabic / Thai / Hindi)

* Shared in both DigIType and Bitmap

### Font Data Size

<table>
<thead>
<tr>
<th>Font Data Size</th>
<th>Arabic</th>
<th>Thai</th>
<th>Vietnamese</th>
<th>Hindi</th>
<th>Hebrew</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bitmap Font</td>
<td>100KB</td>
<td>22KB</td>
<td>40KB</td>
<td>44KB</td>
<td>3KB</td>
</tr>
<tr>
<td>DigIType Font</td>
<td>420KB</td>
<td>67KB</td>
<td>120KB</td>
<td>200KB</td>
<td>7KB</td>
</tr>
</tbody>
</table>

- **Standard font**: Unicode

* Bitmap Font size varies with each pixel size family.
* Bitmap Font is compatible only with BDF data as of now

**Deliverables**

### Bitmap Font

- Layout engine library
- Font data
- Layout porting / specification guides

### DigIType Font

- Layout engine library
- Font data
- Rasterizer library
- Rasterizer specification guide
- Layout porting / specification guides
**Bitmap Font, Gray Bitmap Font**

Bitmap Font is recommended for devices with low CPU power.

### Bitmap Font

- Bitmap Font is composed of pixel dots, and is suitable for small display and low-spec device.
  
  **Formats**
  - Raw scan binary data
  - BDF format
  - Embedded in TTF
  - Bitmap image per character
  - Programming source

  Monochrome bitmap (1 bit per pixel): Capacity of one character = \([W+7]/8 \times H\)

  \(W\): width, \(H\): height  \([a]\) is an integral number which does not exceed the real number “a”.

### Gray Bitmap Font

- Gray level Bitmap Font can display character line smoothly even in small sizes.

  16 gradation gray bitmap(4 bit per pixel): Capacity of one character = \([W+7]/8 \times 4 \times H\)

  \(W\): width, \(H\): height  \([a]\) is an integral number which does not exceed the real number “a”.
DynaComware developed a unique radical-based TrueType using “radicals” instead of strokes to minimize the volume of components required in an Asian Font set, making the memory size extremely small. The memory size for Radical-based TrueType is less than 2.5MB, only one fourth of the original 10MB.

<table>
<thead>
<tr>
<th>Characters</th>
<th>Bitmap Font</th>
<th>Gray Bitmap Font</th>
<th>TrueType Font</th>
</tr>
</thead>
<tbody>
<tr>
<td>Latin set 1</td>
<td>Latin set 2</td>
<td>Cyrillic</td>
<td>Greek</td>
</tr>
<tr>
<td>ISO 8859-1</td>
<td>O</td>
<td>O</td>
<td>—</td>
</tr>
<tr>
<td>ISO 8859-2</td>
<td>—</td>
<td>O</td>
<td>—</td>
</tr>
<tr>
<td>ISO 8859-3</td>
<td>—</td>
<td>O</td>
<td>—</td>
</tr>
<tr>
<td>ISO 8859-4</td>
<td>—</td>
<td>O</td>
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<td>—</td>
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<tr>
<td>ISO 8859-7</td>
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<td>—</td>
<td>—</td>
</tr>
<tr>
<td>ISO 8859-9</td>
<td>O</td>
<td>O</td>
<td>—</td>
</tr>
<tr>
<td>ISO 8859-10</td>
<td>—</td>
<td>O</td>
<td>—</td>
</tr>
<tr>
<td>ISO 8859-15</td>
<td>O</td>
<td>O</td>
<td>—</td>
</tr>
<tr>
<td>ISO 8859-16</td>
<td>—</td>
<td>O</td>
<td>—</td>
</tr>
</tbody>
</table>

Languages which need layout engine (Arabic / Thai / Vietnamese / Hindi / Hebrew)
Layout engine + font layout engine is not provided for TrueType Font.
Multilingual Character Set

Features of Embedded DynaFont include a wide range of language availability and environment compatibility. We have the most suitable multilingual font solution for each country.

Asia
- Japanese (JIS-X0201, JIS-0208)
- Korean (KSX1001)
- Chinese (Simplified Chinese character: GB2312, Traditional Chinese character: Big5, CNS, Hong Kong: HKSCS)

Latin Set 1
- Unicode Basic Latin, Latin-1 Supplement, etc.
  - English
  - French
  - Spanish
  - German
  - Italian
  - Portuguese
  - Indonesian
  - Swedish
  - Dutch
  - Danish
  - Norwegian
  - Finnish
  - Icelandic
  - Faroese

Latin Set 2
- Unicode Basic Latin, Latin-1 Supplement, Latin Extended-A, Latin Extended-B, etc.
  - English
  - French
  - Spanish
  - German
  - Italian
  - Portuguese
  - Indonesian
  - Swedish
  - Dutch
  - Danish
  - Norwegian
  - Finnish
  - Icelandic
  - Faroese
  - Croatian
  - Czech
  - Hungarian
  - Polish
  - Romanian
  - Slovakian
- Eskimo, Nordic

<table>
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<tr>
<th>ISO 8859-1</th>
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<td>—</td>
<td>O</td>
<td>—</td>
<td>—</td>
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</table>

Insufficient letters in Latin set 1:
- Dutch: Lack of [û, û]
- Estonian: Lack of [ś, š, ̀, ʒ]
- French: Lack of [œ, Œ] and [û]
- Finnish: Lack of [š, š, ̀, ʒ]
Multilingual Layout Engine

Arabic
Arabic script is written from right to left, and similar to cursive writing in Latin alphabet, thus letter forms changes depending on next character. Arabic Layout Engine change letter forms and connect them from right to left. When left to right languages such as English are detected, the layout engine will line up the letters correctly.

Thai
Thai character is composed of phonogram and vowel. Vowels are located on four sides of the phonogram (above, below, right, and left), and combination of phonogram and vowel present a letter. Thai layout engine adds vowel on the phonogram and displays characters in real time. This can save considerable memory space compared to pre-combining all of the characters.

Vietnamese
Vietnamese used to be written in Chinese character, now it is written by Roman alphabet, called “Quoc ngu”. It has six tones, alphabet and diagram display vowel, consonant and tone diagram. Vietnamese Layout engine combines alphabet and diagram correctly.

Hindi
Hindi script (Devanagari) is written from left to right. Each word is connected by a horizontal line that runs along the top of full letters. Supplementary vowel letters are added from side to side and up and down. The Hindi layout engine displays them in real time, and optimize the locations of supplementary letters depending on the word.

Hebrew
Hebrew script is written from right to left. Vowel signs are added below consonant letters to describe its pronunciation. The Hebrew layout engine adds vowel to consonant, and displays in real time.

This character set conforms to the standard for digital broadcasting in Japan regulated on SDT-B24 by Association of Radio Industries and Business (ARIB). It contains extended character set for Vehicle Information and Communication System (VICS). Bitmap (Maru Gothic, Kaku Gothic), TrueType, and DigiType are available.

Radio Data System (RDS) is a communications protocol standard for embedding small amounts of digital information in conventional FM radio broadcasts. IEC62106 (Latin, Cyrillic, Greek, Arabic, and Hebrew) is available in Bitmap (Serif&Sans-serif), TrueType, and DigiType Font.
Multilingual Character Set

TrueType Font Typeface Samples

**Chinese GB18030**
- DFHeiW5-A
  - 品质精美设计创新全球风行
    - 0123456789ABCDEabcdef!
- DFKaiW5-A
  - 品质精美设计创新全球风行
    - 0123456789ABCDEabcdef!
- DFSongW3-A
  - 品质精美设计创新全球风行
    - 0123456789ABCDEabcdef!
- DFFangSongW3-A
  - 品质精美设计创新全球风行
    - 0123456789ABCDEabcdef!

**Chinese Big 5**
- DFHeiMedium-B5
  - 品質精美設計創新全球風行
    - 0123456789ABCDEabcdef!
- DFMingMedium-B5
  - 品質精美設計創新全球風行
    - 0123456789ABCDEabcdef!
- DFHeiBold-B5
  - 品質精美設計創新全球風行
    - 0123456789ABCDEabcdef!
- DFMingBold-B5
  - 品質精美設計創新全球風行
    - 0123456789ABCDEabcdef!

**Korean**
- DFKo Gothic-Md
  - 생일축하합니다
    - 0123456789ABCDEabcdef!
- DFKo Gothic-A
  - 생일축하합니다
    - 0123456789ABCDEabcdef!
- DFKo Gothic-Bd
  - 생일축하합니다
    - 0123456789ABCDEabcdef!

**Thai**
- DFP-Thai
  - สุขสันต์วันเกิด
    - 0123456789ABCDEabcdef!

**Hindi**
- DFP-Hindi
  - जन्मदिन मुबारक
    - 0123456789ABCDEabcdef!

**Arabic**
- DFP-Arabic
  - عبد ويلاد سعيد
    - 0123456789ABCDEabcdef!

**Hebrew**
- DFP-Hebrew
  - יומ היום חמה
    - 0123456789ABCDEabcdef!

**Vietnamese**
- DFP-LATINWS
  - Chúc mừng sinh nhật
    - 0123456789ABCDEabcdef!

**Latin set-1,2**
- DFP-LATINWS
  - Pójdźże, kiń tę chmurność w głab fiaszyl! ABCÖŚÚŻ1597@

**Western Languages**
- DFPOLYWG:1
  - The five boxing wizards jump quickly. ALIS1591!
- DFPOLYWG:2
  - The five boxing wizards jump quickly. ALIS1591!
- DFPOLYWG:3
  - The five boxing wizards jump quickly. ALIS1591!

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Font Solutions for Every Operating System

Non OS

Bitmap Font is suitable for equipments with small or monochrome LCD, as well as low end microcomputer or small capacity equipment which is unnecessary real time.

Measuring instrument  Hot-water system  Refrigerator  Washing machine  Blu-ray disc recorder  Microwave  Air conditioner

Windows and Other OS

DynaFont is used for digital camera medical instruments, tablet and ATM terminals.

TV  Tablet  Digital camera  Navigation system  Medical instruments  ATM terminal

Linux OS

You can use embedded DynaFont for a equipments variety of, such as tablet, MFP, automotive product, TV, etc.

Tablet, smart phone  MultiFunction Printer  Car navigation  TV