1. Arabic text composition
   - Engines
   - Others packages
   - \texttt{Arab\TeX}
   - \Omega
   - \texttt{Arabi}

2. Arabic mathematical document composition
   - Mathematical font
   - \texttt{RyDArab}
   - \texttt{CurExt}

3. \texttt{Dad\TeX} – A full Arabic interface
   - Objective
   - Characteristics
Although the typesetting system \TeX was originally designed especially for composition of mathematical documents, it has become a very fine system for typesetting documents in many other fields. The Arabic alphabet–based scripts are some of the linguistic contexts where the use of \TeX has been progressively adapted.

TEX-X\LaTeX{} - 1987: D. Knuth and P. MacKay, Department of Near Eastern Languages and Civilization in University of Washington, presented the basic principles of a system of mixing LTR and RTL text based on \TeX. These principles of bi-directionality and inversion character glyphs are appointed \TeX-X\LaTeX{} and viewed throw dvi-ivd.

Primitives: \begin{R}, \end{R}, \begin{L}, \end{L}
**TEX--XFT** - 1992: developed by Peter Breitenlohner under the aegis of DANTE. It is an extended of TEX-XFT integrated in ε-TEX

**bidi** - 2007: developed by François Charette as an extended of TEX--XFT

**ε-TEX ε-LATEX** 1997: developed as part of the NTS project, supported by DANTE, and compatible with TEX

http://www.ctan.org/tex-archive/systems/e-tex/

**MTEX** : developed by Michael Ferguson

**XFTEX** : developed by Jonathan Kew, extended ε-TEX

http://scripts.sil.org/xetex
TEX programs with Right-to-Left capabilities, knowing the primitives: \beginR, \endR, \beginL, \endL

★ teTEX for UNIX/Linux: ε-TEX

★ NTEX for UNIX: TEX--XGΩ

★ Web2C for Windows, the default TEX program in MikTEX

★ DirectTEX for Older Mac OS: TEX--XGΩ

★ XGΩTEX for Mac OS X, Linux and Windows

★ TEX Live CD-ROMs distributed by TUG
Abandante packages

**Fanton** - 1990: Michel Fanton, INALCO in France, experimente a system based on TEX-XET

**ArabicTEX** - 1994: developed by Y. Halalambous, integrated in DOS-GUT then in Win-GUT GUTenberg interface.


**Al-Amal** - 1996: developed by Y. Halalambous allowing for bi-directionality. It uses fonts (Naskhi) designed with METAFONT and covering all Arabic characters codified by Unicode. It is a part of ScholarTEX. It is a system comprising: an extension of macros, a series of fonts, a preprocessor, utilities (scholars) and compilers for multiple languages (Arabic, Armenian, Hebrew, Greek, ...).
Maintained packages

**Aleph** - 2005: new engine combines the features of \( \varepsilon \- \TeX \) and \( \Omega \). Lamed is the \( \LaTeX \) format using Aleph.


http://www.tex.ac.uk/cgi-bin/texfaq2html

**AIQalam** 2006: developed by Hossam A. H. Fahmy

**ARABXe\TeX** - 2007: package developed by François Charette for bidirectional text. It provides a convenient \( \ARAB \TeX \)-like user-interface for typesetting languages using the Arabic script, with flexible access to font features. It can be used in \( \XeLaTeX \) and also with any \( \varepsilon \- \TeX \)-based engine, notably pdf\( \LaTeX \).

http://scripts.sil.org/TECkit
RTL script package developed by Klaus Lagally, University of Stuttgart, 1990:

- Roman transliteration or Arabic encoding: ISO8859-6, UTF-8
- Important algorithm for Hamza position
- Contextual analyze by some \TeX macros
- Confection of Naskh Arabic font

http://www.informatik.uni-stuttgart.de/ifi(bs/research/arab_e.html

*Example: ▶*
Unicode enhanced version of TeX developed by John Plaice, University of Sydney, and Yannis Haralambous, Fluxus Virus then ENSTB, 1995:

- Unicode input
- Unicode processing
- Multi-lingual composition

http://omega.enstb.org/

Example: ▶

Process: ▶
Arabic and Farsi scripts package developed by Youssef Jabri, Oujda University, 2005:

- used in any TeX engine supporting RTL directionality
- accepts input in several 8-bit encodings: UTF-8, ISO8859-6, CP1256
- is a pure LaTeX/Babel approach to Arabic typesetting, so contextual analysis is done in the fonts

http://theory.uwinnipeg.ca/scripts/CTAN/language/arabic/arabi.zip

Example: ▽
Features of mathematical expressions w.r.t. regular text:

- **Specific symbols:**
  \[ \sqrt{\text{any expression}}, \int, \nabla, \ldots \]

- **Variable sizes and shapes:**
  \[ \sqrt{a}, \sqrt{a + b}, \sqrt{\frac{a}{b}} \]

- **Bi-dimensional:**
  \[ \frac{a}{c + d}, x_i, x^i, \begin{pmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{pmatrix} \]
Features of mathematical expressions w.r.t. regular text:

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- Bi-dimensional:
  \[ \frac{a}{c + d}, \ x_i, \ x^i, \ \begin{pmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{pmatrix} \]
Creating a mathematical font is a complex artistic and technical task

RamzArab

Design and development of the OpenType font RamzArab that tries to meet, as far as possible, the requirements of:

Homogeneity: designing symbols with the same feather for homogeneous shapes, sizes, boldness, . . .

Completeness: regrouping most of the usual specific Arabic symbols in use

Originality: observing the most of practical calligraphic rules
Unicode

The Unicode Standard provides a quite complete set of standard mathematical characters. There is a good deal of symbols found in Arabic mathematical handbooks that are not yet part of the Unicode Standard and can’t be obtained through a simple mirroring nor through a simple implementation process. Some of such special characters, designed in RamzArab, are proposed for inclusion into the Unicode Standard and now are on discussion. Until their adoption by Unicode, the symbols used in these tools will be located in the Private Use Area E000–F8FF in the Basic Multilingual Plane.
RyDArab system preserves all the distinguished qualities:

- a full numerical composition
- a high typographical quality
- offering several options to adapt it to areas and levels
- generating documents in several formats (DVI, PS, PDF)
- producing documents in format HTML with image based mathematical expressions
- towards transformation from/to OpenMath ⊗ MathML
- same commands structure in order to automatist translation (Ar, En, Fr)

http://www.ucam.ac.ma/fssm/rydarab

\[ \sqrt[3]{3b} \text{ of } \{2+\left\{\frac{b*9}{c}\right\}\}\]
Conception of **CurExt** system designing some dynamic symbols. The parentheses and Kashida symbols are representative of the possible cases of horizontal and vertical curvilinear extensibility. So, that can be easily generalized to other variable-sized symbols.

A lengthening of the straight line is not in conformity with the Arabic calligraphy rules.

http://www.ucam.ac.ma/fssm/rydarab

\[
\begin{pmatrix}
5 & 1 & 2 \\
7 & 5 & 4 \\
1 & 8 & 13
\end{pmatrix}
\text{ instead of }
\begin{pmatrix}
5 & 1 & 2 \\
7 & 5 & 4 \\
1 & 8 & 13
\end{pmatrix}
\]

\[
\underbrace{\text{س}}_{
\begin{pmatrix}
7 & 5 & 4 \\
1 & 8 & 13
\end{pmatrix}
} \text{ instead of }
\underbrace{\text{س}}_{
\begin{pmatrix}
7 & 5 & 4 \\
1 & 8 & 13
\end{pmatrix}
}
\]
Facilitate the use and understanding commands of \TeX

- Composer Arabic documents using only Arabic, and control, characters (ex. \, $)
- Avoiding problems due to bidirectional lines
Objective

Characteristics

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- Composer Arabic documents using only Arabic, and control, characters (ex. \, $)
- Avoiding problems due to bidirectional lines
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- Composer Arabic documents using only Arabic, and control, characters (ex. \\, $)
- Avoiding problems due to bidirectional lines
The complex and indirect methods are still used.

**Causes**
- RyDArab et CurExt are not sufficiently known
- \( \text{T\LaTeX} \equiv \) difficult programming language
- Language barrier

**Solution**
- Arabization of \( \text{T\LaTeX} \)
  - Dad\LaTeX
The complex and indirect methods are still used.

**Causes**

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- Language barrier

**Solution**

Arabization of \( \text{T}_{\text{E}}\text{X} \)  

\( \text{DadT}_{\text{E}}\text{X} \)
Problems related to the bidi Unicode algorithm:

- Text selection
- Character position
- Semantic
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- Text selection
- Character position
- Semantic

\texttt{\catcode'}\texttt{\catcode'}=11 ⇝ \texttt{\catcode'}\texttt{\catcode'}=11 ⇝ \texttt{\catcode'}\texttt{\catcode'}=11
Advantages

- Direct: based to \TeX
- Portable: works on all platforms
- Extensible: adding new commands
- Flexible: retranslation commands
- Superficial: without any change in the kernel and packages

Limits

- Adapted Dad\TeX to other systems (Arabi)
- Using RyDArab with Omega into Dad\TeX
- Advanced use of Arabic-Indic numbers
- Localization of filenames

Example: ▷
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- Direct: based to TeX
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- Using RyDArab with Omega into DadTeX
- Advanced use of Arabic-Indic numbers
- Localization of filenames

Example: △
The End

Thank you!
<table>
<thead>
<tr>
<th>Source</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>test1</td>
<td>test1</td>
</tr>
<tr>
<td>$a + b$</td>
<td>$a + b$</td>
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<tr>
<td>$\sqrt{a}$</td>
<td>$\sqrt{a}$</td>
</tr>
<tr>
<td>test2</td>
<td>test2</td>
</tr>
<tr>
<td>$a + b$</td>
<td>$a + b$</td>
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<tr>
<td>$\sqrt{b}$</td>
<td>$\sqrt{b}$</td>
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</tbody>
</table>
### Objective

- Arabic text composition
- Arabic mathematical document composition

**DadTEX** – A full Arabic interface

### Characteristics

<table>
<thead>
<tr>
<th>Source</th>
<th>Result</th>
</tr>
</thead>
</table>
| `test1`<br>`a + b`<br>`μأولى`
| `μثانية`<br>`test2`<br>`μثانية`<br>`μأولى`<br>`test1`<br>`μثانية`<br>`μأولى`<br>`test2`<br>`μثانية` |
Ω process

- omega test.tex
- lambda test.tex
- oxdvi test.dvi
- odvips -o test.ps test.dvi
- gv test.ps
Arabic example

Source

Result
RyDArab example

Source

Result
CurExt example

Source

Result
DadTEX example

This is an English sample text
This is a large English text
This is a mathematical expression $\sqrt{a+b}$

Here is an Arabic sample text
هذا النص هو مثال نص عادي
هذا النص هو مثال نص عريض
اعرض هذا النص هو مثال نص عريض
هذا صفحة رياضية!
$\frac{\text{أحد}}{\text{اثنين}}\left(1+\left(2-\frac{1}{2}\right)\right)$
" نهاية (عربية) "
### Objective

- Arabic text composition
- Arabic mathematical document composition
- DadTeX – A full Arabic interface

### Characteristics

- RamzArab Arabic mathematical symbols

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### Azzeddine LAZREK

29/25

Arabic document composition with TeX