

Bahasa Pemrograman Singkong

Antara Passion dan Kolaborasi Riset

Dr. Noprianto

singkong.dev (PT. Stabil Standar Sinergi)

Agenda

- Antara Bahasa dan Pengembangan Program
- Kenapa Singkong
- Passion dan Kolaborasi
- Lampiran: contoh langkah demi langkah: GUI
- Lampiran: contoh langkah demi langkah: Database dan GUI

Antara Bahasa dan Pengembang Program

Bahasa Pemrograman

```
reset()  
var e = component("text", "")  
var b = component("button", "Halo")  
add(e)  
add_s(b)  
  
event(b, fn() {  
  message(get(e, "contents"))  
})  
  
show()
```



Kode sumber program

Melewati proses translasi

Menjadi program yang dapat dijalankan

Antara Bahasa dan Pengembang Program

Hello, World

```
#include<stdio.h>

int main(void) {
    printf("Hello, World\n");
    return 0;
}
```

C

```
class Hello {
    public static void main(String[] args) {
        System.out.println("Hello, World");
    }
}
```

Java

```
print('Hello, World')
```

Python

```
println("Hello, World")
```

Singkong

Antara Bahasa dan Pengembang Program

Alat Bantu: Tidak Semua Kode Program Harus Diketik

```
class Hello {  
    public static void main(String[] args) {  
        System.out.println("Hello, World");  
    }  
}
```

Java

- **Menggunakan NetBeans**
- New -> Java Class -> Hello
- Di dalam kode class Hello yang dihasilkan:
 - Ketik psvm
 - Tekan <control> <space>
 - Pilih: *public static void main*
 - Tekan Enter
- Dalam kode yang dihasilkan, ketik:
 - System.out.println("Hello, World");
 - **Hanya mengetik 1 baris kode** (dibantu auto complete)



- **Menggunakan NetBeans**
- New -> JFrame Form -> HelloWorld
- Pada Frame yang tampil, drag Button dari Palette
- Ubah text Button di Properties
- Run File
- **Tanpa mengetik 1 baris kode pun**

Antara Bahasa dan Pengembang Program

Perkembangan: Bahasa-Bahasa Baru Lahir Setiap Dekade

| Periode | Jumlah Bahasa Baru | Contoh |
|--------------|--------------------|-------------------------------|
| Sebelum 1950 | >10 | |
| 1950-an | ~50 | FORTRAN, COBOL, LISP |
| 1960-an | ~50 | BASIC |
| 1970-an | ~60 | Pascal, C, SQL |
| 1980-an | ~60 | C++, Perl |
| 1990-an | ~70 | Python, Java, PHP, JavaScript |
| 2000-an | ~50 | C#, Go |
| 2010-an | ~30 | Dart, Swift |

'Timeline of programming languages' (2021). Wikipedia. Available at: https://en.wikipedia.org/wiki/Timeline_of_programming_languages (Accessed: 05 March 2021)

Antara Bahasa dan Pengembang Program

Indeks TIOBE: Bahasa-Bahasa Pemrograman Terpopuler (1-10)

| Feb 2021 | Feb 2020 | Bahasa |
|----------|----------|--------------|
| 1 | 2 | C |
| 2 | 1 | Java |
| 3 | 3 | Python |
| 4 | 4 | C++ |
| 5 | 5 | C# |
| 6 | 6 | Visual Basic |
| 7 | 7 | JavaScript |
| 8 | 8 | PHP |
| 9 | 9 | SQL |
| 10 | 12 | Assembly |

'TIOBE Index for February 2021' (2021). TIOBE. Available at: <https://www.tiobe.com/tiobe-index/> (Accessed: 05 March 2021)

Antara Bahasa dan Pengembang Program

Indeks TIOBE: Bahasa-Bahasa Pemrograman Terpopuler (11-20)

| Feb 2021 | Feb 2020 | Bahasa |
|----------|----------|------------------------|
| 11 | 13 | R |
| 12 | 26 | Groovy |
| 13 | 11 | Go |
| 14 | 15 | Ruby |
| 15 | 10 | Swift |
| 16 | 16 | MATLAB |
| 17 | 18 | Delphi / Object Pascal |
| 18 | 22 | Classic Visual Basic |
| 19 | 19 | Perl |
| 20 | 20 | Objective-C |

'TIOBE Index for February 2021' (2021). TIOBE. Available at: <https://www.tiobe.com/tiobe-index/> (Accessed: 05 March 2021)

Antara Bahasa dan Pengembang Program

Ruang untuk Bahasa Pemrograman Baru

- Menawarkan kelebihan dari bahasa-bahasa yang ada
- **Untuk mendukung end-user programming: kebutuhan personal/hobi atau menyelesaikan pekerjaan**
- Berbagai bahasa yang spesifik untuk domain tertentu (DSL)
- **Mengkombinasikan kelebihan beberapa bahasa ke dalam bahasa yang lebih sederhana**

Kenapa Singkong

Belajar dan Menggunakan Beberapa Bahasa Pemrograman

- Pascal, C, PHP, Python, Java
- Belajar merancang dan mengimplementasikan bahasa domain-spesifik:
 - Perkedel
 - Pangsit
- **Singkong: akhir 2019-sekarang**

Singkong terinspirasi dari tanaman singkong: tersedia meluas, dapat diolah menjadi berbagai jenis makanan atau dimakan apa adanya, dan terjangkau oleh hampir siapa pun.

Kenapa Singkong

Kebutuhan: Jalan di Sebanyak Mungkin Sistem Operasi (1)

- Harus dapat jalan di sebanyak mungkin sistem operasi
 - macOS: dari Mac OS X 10.4 sampai terbaru
 - Windows: dari Windows 98 sampai terbaru
 - Linux: yang dirilis awal tahun 2000-an sampai terbaru
 - Chrome OS: sejak tersedia Linux development environment
 - Solaris
 - FreeBSD
 - OpenBSD
 - NetBSD

**Sekali ditulis,
program yang
ditulis dengan
Singkong
dapat jalan di
sebanyak mungkin
sistem operasi**

Kenapa Singkong

Kebutuhan: Jalan di Sebanyak Mungkin Sistem Operasi (2)

| | |
|-----------|-----------------------------------------------------------------------------------------------------|
| macOS | 11, 10.15, 10.14, Mac OS X 10.4 |
| Windows | 11, 10, 7, XP, 2000, 98 |
| Linux | Ubuntu (22.04, 20.04, 18.04, 16.04, 4.10), Raspberry Pi OS, Red Hat Linux 7.3, Debian 10 di Android |
| Chrome OS | 101 (Linux development environment) |
| Solaris | 11.4 |
| FreeBSD | 13.0, 12.1 |
| OpenBSD | 7.0, 6.6 |
| NetBSD | 9.2, 9.0 |

Agar dapat dijalankan pada sebanyak mungkin sistem operasi, Singkong ditulis dengan **Java** (dan Singkong)

Singkong hanya membutuhkan Java 5.0 (dan telah diuji pada Java versi 17 pada saat presentasi ini disesuaikan)

Java 5.0 dirilis **2004**, **15 tahun sebelum Singkong** mulai dikembangkan

Noprianto. (2023). *Mengenal dan Menggunakan Bahasa Pemrograman Singkong*. Jakarta: PT. Stabil Standar Sinergi, pp.4

Kenapa Singkong

Kebutuhan: Sintaks Sesederhana Mungkin

- Prosedural, *tidak* berorientasi objek
- Tidak membedakan huruf besar dan huruf kecil
- Mendukung fungsi rekursif, first class function, fungsi dalam fungsi

```
var name = "Singkong"
println(NAME)
```

```
var f = fn(x) {
  if (x == 1) {
    1
  } else {
    x * f(x-1)
  }
}
```

```
var f = fn(x) {
  return x
}

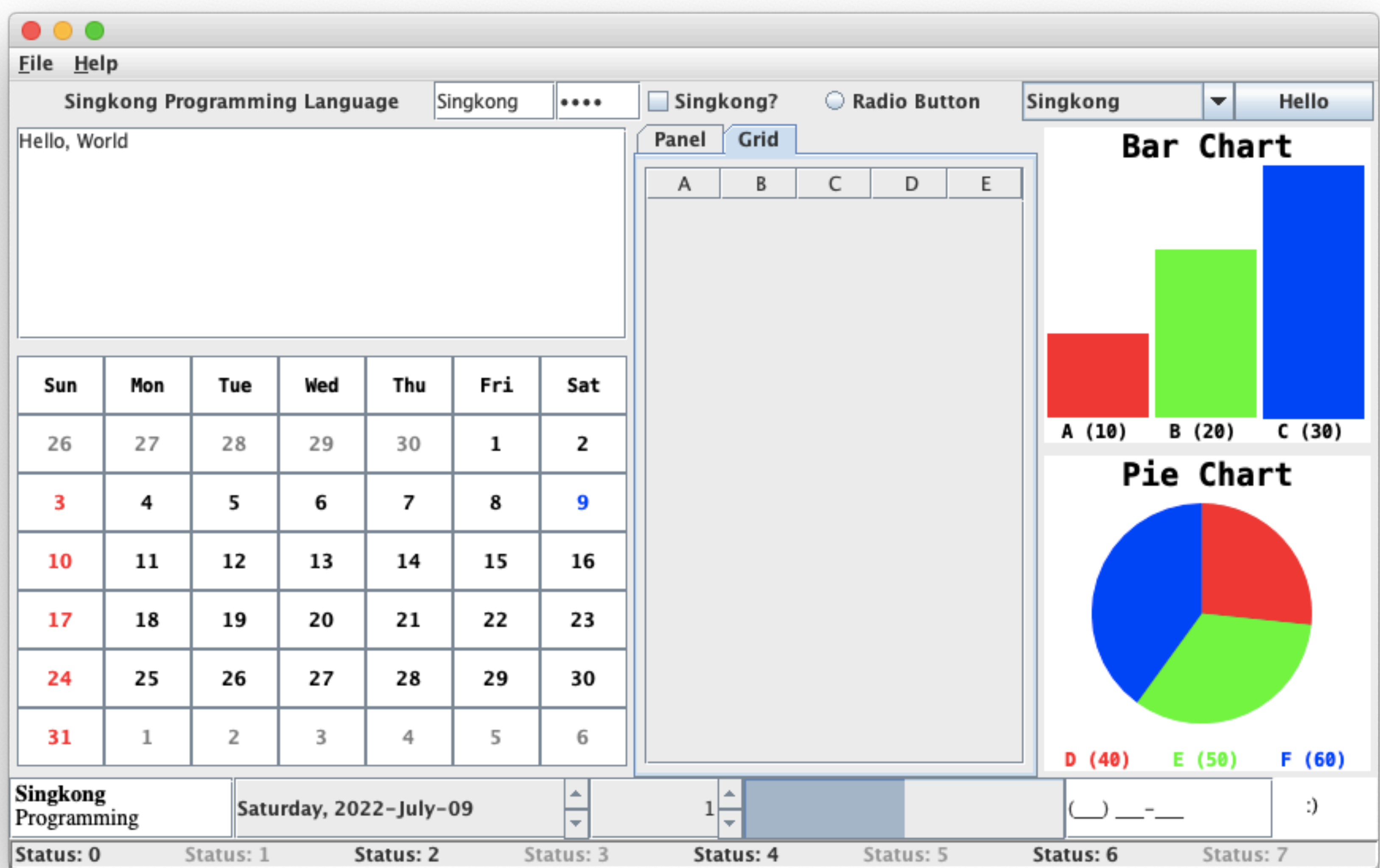
var g = fn(x) {
  return x * x
}

var h = f(g)(10)
println(h)
```

```
var a = fn() {
  println("a")
  var b = fn() {
    println("b")
    var c = fn() {
      println("c")
      var d = fn() {
        println("d")
      }
      d()
    }
    c()
  }
  b()
}
a()
```

Kenapa Singkong

Kebutuhan: GUI Harus Dapat Dibuat Semudah Mungkin (1)



- Menu bar
 - Status bar
 - Konfirmasi keluar aplikasi
 - Bar Chart
 - Button
 - Checkbox
 - Combobox
 - Date
 - Draw
 - Edit
 - Image
 - Label
 - Mask
 - Password
 - Pie Chart
 - Progress
 - Radio
 - Tab
 - Panel
 - Grid
 - Spin
 - Table
 - Text
 - View
 - Kalender
- Semua dalam 73 baris**

Kenapa Singkong

Kebutuhan: GUI Harus Dapat Dibuat Semudah Mungkin (2)

```
reset()
var b = component("button", "Hello")
var c = component("checkbox", "Singkong?")
var m = component("combobox", "Singkong,Programming,Language")
var d = component("date", "EEEE, yyyy-MM-dd")
var e = component("edit", "Hello, World")
var i = component("image", "image.jpg")
var l = component("label", "Singkong Programming Language")
var p = component("password", "test")
var sp = component("spin", "1,0,10,2")
var g = component("progress", "")
config(g, "contents", 50)
var r = component("radio", "Radio Button")
var a = component("tab", "")
var panel = component("panel", "Panel")
var t1 = component("table", "A,B,C,D,E")
var grid = component("grid", "Grid")
var t2 = component("table", "A,B,C,D,E")
var x = component("text", "Singkong")
var v = component("view", "<b>Singkong</b><br>Programming")
var s = component("mask", "(###) ###-###")
var dr = component("draw", "50, 50")

config(dr, "foreground", "black")
config(dr, "background", "white")
draw_string(dr, ":"), 20, 22)

panel_add(panel, t1, 10, 10, 250, 400)
tab_add(a, panel)
grid_add(grid, t2, 0, 0, 1, 1, 1, 1, 3, 0, 5, 5, 5, 5)
tab_add(a, grid)

var bc = component("barchart", "")
config(bc, "foreground", "black")
config(bc, "background", "white")
```

```
config(bc, "font", ["monospaced", 1, 20])
config(bc, "text", "Bar Chart")
config(bc, "contents", [[10, "A (10)", "red"], [20, "B (20)", "green"],
[30, "C (30)", "blue"]])

var pc = component("piechart", "")
config(pc, "foreground", "black")
config(pc, "background", "white")
config(pc, "font", ["monospaced", 1, 20])
config(pc, "text", "Pie Chart")
config(pc, "contents", [[40, "D (40)", "red"], [50, "E (50)", "green"],
[60, "F (60)", "blue"]])

var grid_chart = component("grid", "Grid")
grid_add(grid_chart, bc, 0, 0, 1, 1, 1, 1, 3, 0)
grid_add(grid_chart, pc, 0, 1, 1, 1, 1, 1, 3, 0)

var ge = component("grid", "")
load_module("ui_calendar")
var dd = part(@)
var ca = create_calendar_simple_compact(dd[0], dd[1])
grid_add(ge, e, 0, 0, 1, 1, 1, 1, 3, 0)
grid_add(ge, ca, 0, 1, 1, 1, 1, 1, 3, 0)

add([ge, a, grid_chart])
add_n([i, l, x, p, c, r, m, b])
add_s([v, d, sp, g, s, dr])

each(range(0,8), fn(e, i) {
    statusbar(e, "Status: " + e, i%2 == 0)
})

menubar([
    ["File", 0, [ ["Quit", 0, true, fn() {frame_close()}] ]],
    ["Help", 0, [ ["About", 0, true, fn() {message("Singkong")}] ]]
])

closing("Are you sure you want to quit this application?",
    "Please confirm")
show()
```

Kenapa Singkong

Kebutuhan: GUI Harus Dapat Dibuat Semudah Mungkin (3)



- Editor teks sederhana
 - Buka/Simpan file
- Semua dalam < 30 baris**

```
reset()
var e = component("edit", "")
var o = component("button", "open")
var s = component("button", "save")
var l = component("label", "")

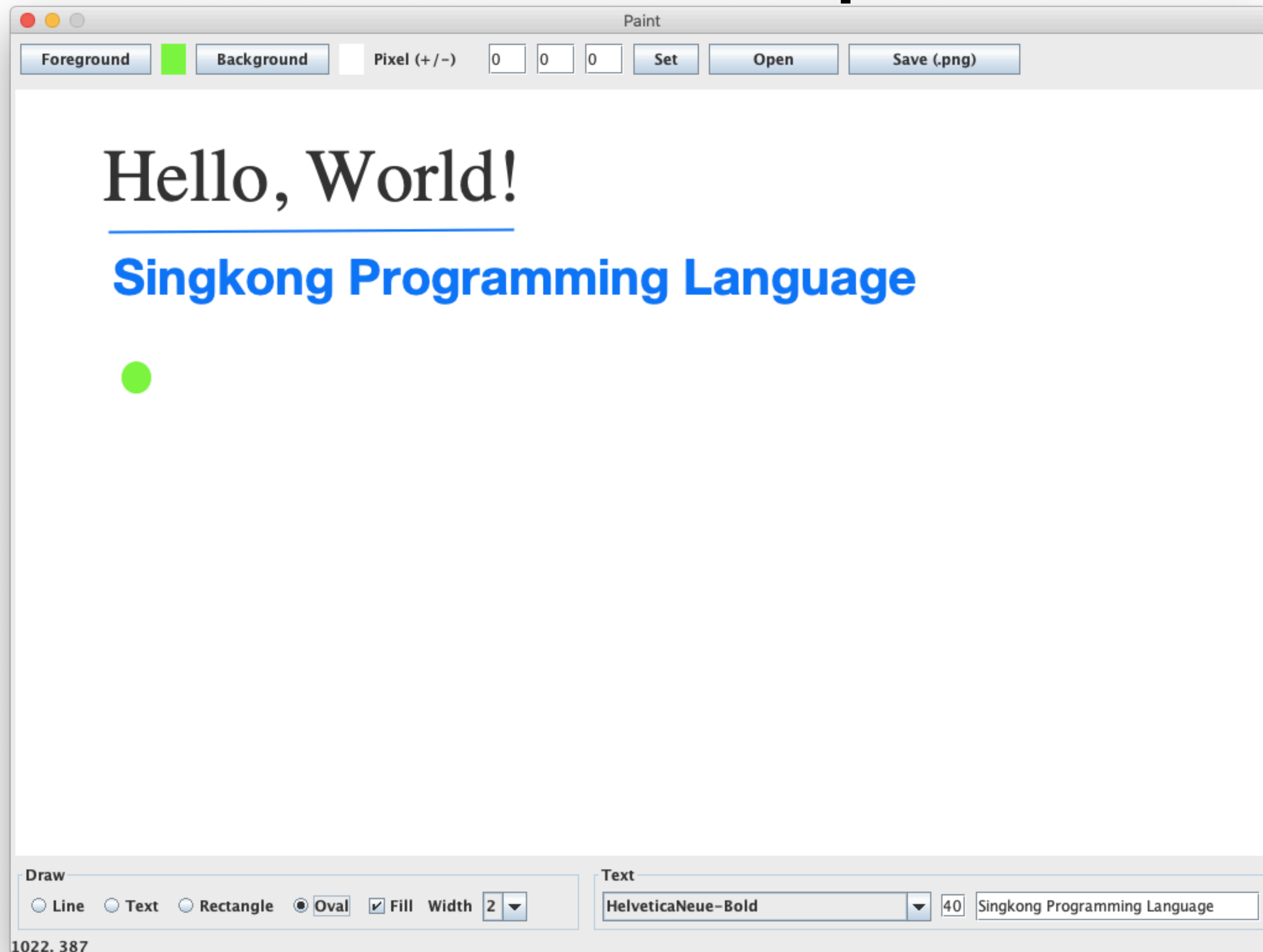
var oo = fn() {
  var f = open()
  if (!empty(f)) {
    config(e, "contents", read(f))
    config(l, "text", f)
  }
}
event(o, oo)

var ss = fn() {
  var f = save()
  if (!empty(f)) {
    var t = get(e, "contents")
    write(f, t)
    config(l, "text", f)
  }
}
event(s, ss)

add_n(l)
add(e)
add_s([o, s])
show()
```


Kenapa Singkong

Kebutuhan: GUI Harus Dapat Dibuat Semudah Mungkin (4)



- Program paint sederhana
 - Buka/Simpan file gambar
 - Menggambar sederhana dengan mouse
 - Dapat menambahkan teks
 - Mengubah nilai RGB pixel
- Semua dalam < 200 baris**

Kenapa Singkong

Kebutuhan: Dukungan Database Relasional (1)

- Koneksi dan query (dengan transaksi) semudah mungkin, dalam masing-masing 1 baris kode
- Database relasional tanpa menggunakan SQL secara langsung
- Bundel JDBC Driver:
 - Apache Derby: Network Server, Driver (Embedded, Client)
 - PostgreSQL
- Dapat menggunakan berbagai JDBC Driver lain

Kenapa Singkong

Kebutuhan: Dukungan Database Relasional (2)

| A | B |
|----|-------------|
| 28 | Hello World |
| 11 | Hello World |
| 65 | Hello World |
| 37 | Hello World |
| 62 | Hello World |
| 64 | Hello World |
| 88 | Hello World |
| 45 | Hello World |

- GUI
 - Koneksi database
 - Query: pembuatan tabel
 - Query: insert
 - Query: update
 - Query: select
- Semua dalam < 25 baris
(atau hanya 15 baris
dengan modul db_util)**

```
load_module("db_util")

reset()
var t = component("table", "A,B", true)
add(t)

var d = db_connect_embed("test")
if (d != null) {
    db_create_table_embed(d, "test", [{"a", "integer."}, {"b", "varchar."}])

    db_insert(d, "test", {"a": random(0,100), "b": "hello"})
    db_update(d, "test", [{"b = ", "hello", ""}], {"b": "Hello World"})

    var r = db_select_all(d, "test")
    if (!empty(r)) {
        config(t, "contents", r[0])
    }
}

show()
```

```
reset()
var t = component("table", "A,B", true)
add(t)

var d = database("org.apache.derby.jdbc.EmbeddedDriver", "jdbc:derby:test;create=true", "", "")
if (d != null) {
    var q = [ ["create table test(a integer, b varchar(64))", []] ]
    var r = query(d, q)

    var q = [
        ["insert into test(a,b) values(?, ?)", [random(0,100), "hello"]],
        ["update test set b=? where b=?", ["Hello World", "hello"]]
    ]
    var r = query(d, q)

    var q = [ ["select a,b from test", []] ]
    var r = query(d, q)
    if (!empty(r)) {
        config(t, "contents", r[0])
    }
}

show()
```

Kenapa Singkong

Kebutuhan: HTTP dan Multithreading



A login dialog box titled "Konfeksi [server_production]". It contains two input fields labeled "User" and "Password". Below the fields are two buttons: "OK" and "Cancel".

- Frontend modul aplikasi konfeksi
- Bekerja dengan HTTP API
- Backend ditulis dengan Singkong
- Komunikasi dengan backend oleh thread tersendiri



The main application window titled "Konfeksi" has a tabbed interface with "Produk", "Kategori Produk", and "Profil" tabs. The "Produk" tab is active, showing a table with columns: Kode, Nama, Kategori, Stok, Modal, Harga, and Keterangan. To the right of the table are four buttons: "Tambah" (green), "Ubah" (cyan), "Hapus" (red), and "Muat Ulang" (yellow). Below the table is a search section with "Data:" and "Pencarian:" labels and an input field. A modal dialog titled "Informasi" is displayed in the center, showing a welcome message: "Selamat datang, Administrator" and "Login terakhir: 2022-04-27 19:39:25", with an "OK" button. Below the search section is a "Detil" section with form fields for "Kode", "Nama", "Kategori" (a dropdown menu), "Dimensi (p, l, t)" (three small input fields), and "Catatan" (a text area). To the right of these fields are three checkboxes: "Jual", "Bahan baku", and "Borongon". The status bar at the bottom shows "admin (Administrator) #1190", the date and time "2022-04-28 02:40", a help key "[F1=Bantuan]", and the server name "server_production".

Kenapa Singkong

Kebutuhan: Tipe Data Praktis

| Tipe Data | Deskripsi | Catatan |
|-----------|-------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| NUMBER | Bilangan bulat dan desimal | Batas maksimum tidak ditentukan. Scale 1-16 (default 4). Dapat diterapkan langsung pada aplikasi keuangan dan saintifik. Operator: + - * / == != %(remainder) ^(power) < <= > >= |
| BOOLEAN | true atau false | |
| STRING | Data string atau teks | Panjang tidak dibatasi. Diapit dengan kutip ganda. Operator: +(concatenation) -(remove) ==(equals,case-sensitive) != *(repeat) |
| ARRAY | Array (heterogen, Campur berbagai tipe), array dalam array. | Panjang tidak dibatasi. Termasuk rectangular array. Operator: +(add), -(remove) == != |
| HASH | Hash table / dictionary | Jumlah pemetaan tidak dibatasi. Memperhatikan insertion-order. Operator: +(add dictionary), -(remove) == != |
| DATE | Tanggal dan Waktu | @ @Y @YY @YYY @YYYY @YYYYM @YYYYMM @YYYYMMD @YYYYMMDD @YYYYMMDDh @YYYYMMDDhh @YYYYMMDDhhm @YYYYMMDDhhmm @YYYYMMDDhhmms @YYYYMMDDhhmmss |
| FUNCTION | Fungsi | First class. Mendukung documentation string. Mendukung rekursif. Mendukung fungsi dalam fungsi. |
| BUILTIN | Fungsi bawaan | Menyediakan berbagai fungsionalitas |
| COMPONENT | Komponen GUI | "barchart", "button", "checkbox", "combobox", "date", "draw", "edit", "grid", "image", "label", "mask", "panel", "password", "piechart", "progress", "radio", "spin", "tab", "table", "text", "view" |
| DATABASE | Koneksi Database | |
| NULL | null | |

Kenapa Singkong

Kebutuhan: Fungsi dan Modul Bawaan

- Menyediakan berbagai fungsionalitas siap pakai
- Modul bawaan ditulis dengan Singkong
- Fungsi dan modul bawaan akan ditambahkan secara berkala

Singkong
v8.7

344

Fungsi bawaan

8

Modul bawaan

Kenapa Singkong

Dapat Memanggil Method Java, Dapat Di-Embed ke Aplikasi Java (1)

Singkong dapat memanggil method yang ditulis dengan Bahasa Pemrograman Java dan mendapatkan nilai kembalian dari pemanggilan method tersebut.

Dengan demikian, fungsionalitas yang tidak disediakan oleh fungsi built-in dan tidak dapat dibuat dengan kode Singkong saja, dapat ditulis dalam Java.

Kenapa Singkong

Dapat Memanggil Method Java, Dapat Di-Embed ke Aplikasi Java (2)

Apabila diinginkan, programmer Java bisa menambahkan Singkong.jar ke class path dan menggunakan interpreter Singkong untuk menginterpretasikan kode program Singkong, yang mungkin didapatkan dari input user. Singkong dapat berfungsi sebagai scripting engine sederhana dalam hal ini.

Kenapa Singkong

Singkong.jar (4,3 MB): Evaluator, Editor, Database Tool, Dokumentasi (1)



Kenapa Singkong

Singkong.jar (4,3 MB): Evaluator, Editor, Database Tool, Dokumentasi (2)



Kenapa Singkong

Singkong.jar (4,3 MB): Evaluator, Editor, Database Tool, Dokumentasi (3)



Kenapa Singkong

Singkong.jar (4,3 MB): Evaluator, Editor, Database Tool, Dokumentasi (4)

- Bundel bersama JDBC Driver:
 - Apache Derby: Network Server, Driver (Embedded, Client)
 - PostgreSQL
- Modul Singkong (ditulis dengan Singkong)

Kenapa Singkong

Buku Singkong: `singkong.pdf`

- Buku tersedia gratis, ditulis dalam Bahasa Indonesia
- Mencakup semua yang dibutuhkan untuk mempelajari Singkong, termasuk berbagai contoh kode
- Selalu diperbaharui sesuai dengan versi terbaru Singkong (dirilis pada waktu yang sama)
- Buku dalam format siap cetak

Kenapa Singkong

Distribusi Aplikasi Anda Dalam File Jar Tunggal

- Aplikasi yang Anda kembangkan, bersama semua file pendukung (termasuk modul, gambar, suara, class Java), dapat dibundel bersama interpreter Singkong.
 - Menjadi file jar tunggal
 - Selama nama file jar aplikasi Anda tidak mengandung kata “Singkong”
- File jar tunggal tersebut dapat dijalankan di semua sistem operasi yang telah terinstall Java 5.0 atau lebih baru
 - Secara teknis, Anda dapat pula membundel Java runtime bersama file jar tunggal aplikasi Anda

Passion dan Kolaborasi

Bahasa Pemrograman Monkey

- Singkong berbasiskan pada Monkey.java (sekitar 3.000 baris kode Java)
 - Monkey.java berbasiskan pada monkey.py (sekitar 2.000 baris kode Python)
 - monkey.py berbasiskan pada kode dalam Bahasa Go, dalam buku: WRITING AN INTERPRETER IN GO
- Tersedia pula implementasi Bahasa Monkey dengan Singkong: monkey.singkong (sekitar 2.100 baris kode Singkong)
- monkey.singkong, Monkey.java, dan monkey.py adalah free/open source dan dapat didownload dari situs web Singkong (<https://nopri.github.io>)
- Saat ini, source code Singkong (v8.7) berukuran lebih dari 12 kali Monkey.java, dalam lebih dari 34.000 baris kode Java dan Singkong

Passion dan Kolaborasi

Sedikit Demi Sedikit

- Dari sekedar proyek hobi, Singkong kini telah menjadi passion, memungkinkan:
 - Singkong telah digunakan di production (backend ataupun frontend)
 - Bug perlu diperbaiki
 - Fungsionalitas tambahan perlu disediakan
 - Beberapa aplikasi berjalan telah/sedang ditulis ulang dengan Singkong
 - Rilis dilakukan berkala
 - Porting beberapa pustaka ke Singkong sedang/akan dilakukan

Passion dan Kolaborasi

Riset dan Pengembangan Bersama

| Kategori | Pekerjaan | Deskripsi |
|----------|----------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Editor | Editor, plugin untuk editor | Editor yang datang bersama Singkong.jar masih sederhana. Selama masih diperlukan, editor ataupun plugin-plugin untuk berbagai editor akan dikerjakan secara kolaboratif. |
| Buku | Berbagai buku ilmu komputer | Berbagai topik dengan implementasi dalam Bahasa Singkong. Saat ini, terdapat beberapa buku cetak yang telah beredar, dan beberapa lagi sedang ditulis atau dipersiapkan. |
| Pustaka | Pembuatan atau porting pustaka | Pembuatan pustaka untuk Singkong ataupun porting pustaka yang ditulis dengan bahasa pemrograman lain ke Singkong |
| Aplikasi | Pengembangan aplikasi dengan bahasa Singkong | Contoh: Bakwan, sebuah aplikasi akunting sederhana sedang dikembangkan secara kolaboratif. |

Terima Kasih

atas perhatian dan partisipasi Anda :)

Lampiran di halaman berikut >

Contoh: GUI

GUI: 4 baris

```
reset()  
title("Matrix")  
closing("Are you sure you want to quit this application?", "Please confirm")  
show()
```

Contoh: GUI

GUI: 10 baris

```
load_module("ui_util")

reset()
var t = component("table", "A,B,C,D,E,F,G,H,I,J")
table_add_fill(t, "")
add(t)

title("Matrix")
closing("Are you sure you want to quit this application?", "Please confirm")
show()
```

Contoh: GUI

GUI: 11 baris

```
load_module("ui_util")

reset()
var t = component("table", "A,B,C,D,E,F,G,H,I,J")
var r = component("table", "Property, Value")
table_add_fill(t, "")
add([t, r])

title("Matrix")
closing("Are you sure you want to quit this application?", "Please confirm")
show()
```

Contoh: GUI

GUI: 30 baris

```
load_module("ui_util")
load_module("rect_array_util")

var functions = [{"Square", is_square_rect_array_of_number},
  ["Diagonal", is_diagonal_rect_array_of_number],
  ["Identity", is_identity_rect_array_of_number],
  ["Upper Triangular", is_upper_triangular_rect_array_of_number],
  ["Lower Triangular", is_lower_triangular_rect_array_of_number],
  ["Zero", is_zero_rect_array_of_number],
  ["Symmetric", is_symmetric_rect_array_of_number],
  ["Add (itself)", add_rect_array_of_number, null],
  ["Subtract (itself)", sub_rect_array_of_number, null],
  ["Multiply (itself)", mul_rect_array_of_number, null],
  ["Trace", trace_rect_array_of_number],
  ["Transpose", transpose_rect_array_of_number],
  ["Determinant", determinant_rect_array_of_number],
  ["Inverse", inverse_rect_array_of_number]]

reset()
var t = component("table", "A,B,C,D,E,F,G,H,I,J")
var r = component("table", "Property, Value")
each(functions, fn(e, i) {
  table_add(r, [[e[0]]])
})
table_add_fill(t, "")
add([t, r])

title("Matrix")
closing("Are you sure you want to quit this application?", "Please confirm")
show()
```

Contoh: GUI

GUI: 35 baris

```
load_module("ui_util")
load_module("rect_array_util")

var functions = [{"Square", is_square_rect_array_of_number},
  ["Diagonal", is_diagonal_rect_array_of_number],
  ["Identity", is_identity_rect_array_of_number],
  ["Upper Triangular", is_upper_triangular_rect_array_of_number],
  ["Lower Triangular", is_lower_triangular_rect_array_of_number],
  ["Zero", is_zero_rect_array_of_number],
  ["Symmetric", is_symmetric_rect_array_of_number],
  ["Add (itself)", add_rect_array_of_number, null],
  ["Subtract (itself)", sub_rect_array_of_number, null],
  ["Multiply (itself)", mul_rect_array_of_number, null],
  ["Trace", trace_rect_array_of_number],
  ["Transpose", transpose_rect_array_of_number],
  ["Determinant", determinant_rect_array_of_number],
  ["Inverse", inverse_rect_array_of_number]]

reset()
var t = component("table", "A,B,C,D,E,F,G,H,I,J")
var r = component("table", "Property, Value")
each(functions, fn(e, i) {
  table_add(r, [[e[0]]])
})
table_add_fill(t, "")
add([t, r])

var b = component("button", "Run")
event(b, fn() {
})
add_s(b)

title("Matrix")
closing("Are you sure you want to quit this application?", "Please confirm")
show()
```

Contoh: GUI

GUI: 36 baris

```
load_module("ui_util")
load_module("rect_array_util")

var functions = [{"Square", is_square_rect_array_of_number},
  ["Diagonal", is_diagonal_rect_array_of_number],
  ["Identity", is_identity_rect_array_of_number],
  ["Upper Triangular", is_upper_triangular_rect_array_of_number],
  ["Lower Triangular", is_lower_triangular_rect_array_of_number],
  ["Zero", is_zero_rect_array_of_number],
  ["Symmetric", is_symmetric_rect_array_of_number],
  ["Add (itself)", add_rect_array_of_number, null],
  ["Subtract (itself)", sub_rect_array_of_number, null],
  ["Multiply (itself)", mul_rect_array_of_number, null],
  ["Trace", trace_rect_array_of_number],
  ["Transpose", transpose_rect_array_of_number],
  ["Determinant", determinant_rect_array_of_number],
  ["Inverse", inverse_rect_array_of_number]]

reset()
var t = component("table", "A,B,C,D,E,F,G,H,I,J")
var r = component("table", "Property, Value")
each(functions, fn(e, i) {
  table_add(r, [[e[0]]])
})
table_add_fill(t, "")
add([t, r])

var b = component("button", "Run")
event(b, fn() {
  var m = table_get_array_number(t)
})
add_s(b)

title("Matrix")
closing("Are you sure you want to quit this application?", "Please confirm")
show()
```


Contoh: GUI

GUI: 44 baris

```
load_module("ui_util")
load_module("rect_array_util")

var functions = [{"Square", is_square_rect_array_of_number},
  ["Diagonal", is_diagonal_rect_array_of_number],
  ["Identity", is_identity_rect_array_of_number],
  ["Upper Triangular", is_upper_triangular_rect_array_of_number],
  ["Lower Triangular", is_lower_triangular_rect_array_of_number],
  ["Zero", is_zero_rect_array_of_number],
  ["Symmetric", is_symmetric_rect_array_of_number],
  ["Add (itself)", add_rect_array_of_number, null],
  ["Subtract (itself)", sub_rect_array_of_number, null],
  ["Multiply (itself)", mul_rect_array_of_number, null],
  ["Trace", trace_rect_array_of_number],
  ["Transpose", transpose_rect_array_of_number],
  ["Determinant", determinant_rect_array_of_number],
  ["Inverse", inverse_rect_array_of_number]]

reset()
var t = component("table", "A,B,C,D,E,F,G,H,I,J")
var r = component("table", "Property, Value")
each(functions, fn(e, i) {
  table_add(r, [[e[0]]])
})
table_add_fill(t, "")
add([t, r])

var b = component("button", "Run")
event(b, fn() {
  var m = table_get_array_number(t)
  config(r, "contents", [])
  each(functions, fn(e, i) {
    if (len(e) == 3) {
      table_add(r, [[e[0], e[1](m, m)]])
    } else {
      table_add(r, [[e[0], e[1](m)]]))
    }
  })
})
add_s(b)

title("Matrix")
closing("Are you sure you want to quit this application?", "Please confirm")
show()
```

Contoh: GUI

GUI: Matriks

Sekali ditulis,
program yang
ditulis dengan
Singkong
dapat jalan di
sebanyak mungkin
sistem operasi
(terbaru ataupun
yang dirilis sekitar
25 tahun lalu)



Contoh: GUI dan Database

GUI dan Database: 4 baris

```
reset()  
title("Products")  
closing("Are you sure you want to quit this application?", "Please confirm")  
show()
```

Contoh: GUI dan Database

GUI dan Database: 10 baris

```
reset()  
var t = component("table", "ID, NAME, PRICE")  
table_right(t, 0)  
table_right(t, 2)  
  
add(t)  
  
title("Products")  
closing("Are you sure you want to quit this application?", "Please confirm")  
show()
```

Contoh: GUI dan Database

GUI dan Database: 18 baris

```
load_module("db_util")

var d = db_connect_embed("database_test")
if (d == null) {
    message("Cannot connect to database", "Error")
    exit()
}

reset()
var t = component("table", "ID, NAME, PRICE")
table_right(t, 0)
table_right(t, 2)

add(t)

title("Products")
closing("Are you sure you want to quit this application?", "Please confirm")
show()
```

Contoh: GUI dan Database

GUI dan Database: 19 baris

```
load_module("db_util")

var d = db_connect_embed("database_test")
if (d == null) {
    message("Cannot connect to database", "Error")
    exit()
}
db_create_table_embed(d, "products", [{"id", "id"}, {"name", "varchar."}, {"price", "decimal."}])

reset()
var t = component("table", "ID, NAME, PRICE")
table_right(t, 0)
table_right(t, 2)

add(t)

title("Products")
closing("Are you sure you want to quit this application?", "Please confirm")
show()
```

Contoh: GUI dan Database

GUI dan Database: 32 baris

```
load_module("db_util")

var d = db_connect_embed("database_test")
if (d == null) {
    message("Cannot connect to database", "Error")
    exit()
}
db_create_table_embed(d, "products", [{"id", "id"}, {"name", "varchar."}, {"price", "decimal."}])

var reload = fn() {
    config(t, "contents", [])
    var r = query_result(db_select_all(d, "products"))
    var rr = []
    if (r != null) {
        each(r, fn(e, i) {
            var rr = rr + [e[0], e[1], number_group(e[2], ",", ".")]
        })
    }
    config(t, "contents", rr)
}

reset()
var t = component("table", "ID, NAME, PRICE")
table_right(t, 0)
table_right(t, 2)

add(t)

reload()
title("Products")
closing("Are you sure you want to quit this application?", "Please confirm")
show()
```

Contoh: GUI dan Database

GUI dan Database: 38 baris

```
load_module("db_util")

var d = db_connect_embed("database_test")
if (d == null) {
    message("Cannot connect to database", "Error")
    exit()
}
db_create_table_embed(d, "products", [{"id", "id"}, {"name", "varchar."}, {"price", "decimal."}])

var reload = fn() {
    config(t, "contents", [])
    var r = query_result(db_select_all(d, "products"))
    var rr = []
    if (r != null) {
        each(r, fn(e, i) {
            var rr = rr + [e[0], e[1], number_group(e[2], ",", ".")]
        })
    }
    config(t, "contents", rr)
}

reset()
var g = component("grid", "")
var t = component("table", "ID, NAME, PRICE")
table_right(t, 0)
table_right(t, 2)
var b_new = component("button", "New")
var b_del = component("button", "Delete")
grid_add(g, t, 0, 0, 3, 1, 1.0, 1.0, 3, 0, 5, 5, 5, 5)
grid_add(g, b_new, 0, 1, 1, 1, 0.5, 0.0, 3, 0, 5, 5, 5, 5)
grid_add(g, b_del, 1, 1, 1, 1, 0.5, 0.0, 3, 0, 5, 5, 5, 5)

add(g)

reload()
title("Products")
closing("Are you sure you want to quit this application?", "Please confirm")
show()
```


Contoh: GUI dan Database

GUI dan Database: 52 baris

```
load_module("db_util")

var d = db_connect_embed("database_test")
if (d == null) {
    message("Cannot connect to database", "Error")
    exit()
}
db_create_table_embed(d, "products", [{"id", "id"}, {"name", "varchar."}, {"price", "decimal."}])

var reload = fn() {
    config(t, "contents", [])
    var r = query_result(db_select_all(d, "products"))
    var rr = []
    if (r != null) {
        each(r, fn(e, i) {
            var rr = rr + [e[0], e[1], number_group(e[2], ",", ".")]
        })
    }
    config(t, "contents", rr)
}

reset()
var g = component("grid", "")
var t = component("table", "ID, NAME, PRICE")
table_right(t, 0)
table_right(t, 2)
var b_new = component("button", "New")
var b_del = component("button", "Delete")
grid_add(g, t, 0, 0, 3, 1, 1.0, 1.0, 3, 0, 5, 5, 5, 5)
grid_add(g, b_new, 0, 1, 1, 1, 0.5, 0.0, 3, 0, 5, 5, 5, 5)
grid_add(g, b_del, 1, 1, 1, 1, 0.5, 0.0, 3, 0, 5, 5, 5, 5)

var g_detail = component("grid", "")
config(g_detail, "border", "Detail")
var l_name = component("label", "Name")
var t_name = component("text", "")
var l_price = component("label", "Price")
var t_price = component("text", "")
var b_save = component("button", "Save")
grid_add(g_detail, l_name, 0, 0, 1, 1, 0.0, 0.5, 0, 1, 5, 5, 5, 5)
grid_add(g_detail, t_name, 1, 0, 1, 1, 1.0, 0.5, 1, 1, 5, 5, 5, 5)
grid_add(g_detail, l_price, 2, 0, 1, 1, 0.0, 0.5, 0, 1, 5, 5, 5, 5)
grid_add(g_detail, t_price, 3, 0, 1, 1, 0.1, 0.5, 1, 1, 5, 5, 5, 5)
grid_add(g_detail, b_save, 4, 0, 1, 1, 0.0, 0.5, 1, 1, 5, 5, 5, 5)

grid_add(g, g_detail, 0, 2, 3, 1, 1.0, 0.0, 3, 0, 5, 5, 5, 5)
add(g)

reload()
title("Products")
closing("Are you sure you want to quit this application?", "Please confirm")
show()
```

Contoh: GUI dan Database

GUI dan Database: 58 baris

```
load_module("db_util")

var d = db_connect_embed("database_test")
if (d == null) {
    message("Cannot connect to database", "Error")
    exit()
}
db_create_table_embed(d, "products", [{"id", "id"}, {"name", "varchar."}, {"price", "decimal."}])

var reload = fn() {
    config(t, "contents", [])
    var r = query_result(db_select_all(d, "products"))
    var rr = []
    if (r != null) {
        each(r, fn(e, i) {
            var rr = rr + [e[0], e[1], number_group(e[2], ",", ".")]
        })
    }
    config(t, "contents", rr)
}

reset()
var g = component("grid", "")
var t = component("table", "ID, NAME, PRICE")
table_right(t, 0)
table_right(t, 2)
var b_new = component("button", "New")
var b_del = component("button", "Delete")
grid_add(g, t, 0, 0, 3, 1, 1.0, 1.0, 3, 0, 5, 5, 5, 5)
grid_add(g, b_new, 0, 1, 1, 1, 0.5, 0.0, 3, 0, 5, 5, 5, 5)
grid_add(g, b_del, 1, 1, 1, 1, 0.5, 0.0, 3, 0, 5, 5, 5, 5)

var g_detail = component("grid", "")
config(g_detail, "border", "Detail")
var l_name = component("label", "Name")
var t_name = component("text", "")
var l_price = component("label", "Price")
var t_price = component("text", "")
var b_save = component("button", "Save")
grid_add(g_detail, l_name, 0, 0, 1, 1, 0.0, 0.5, 0, 1, 5, 5, 5, 5)
grid_add(g_detail, t_name, 1, 0, 1, 1, 1.0, 0.5, 1, 1, 5, 5, 5, 5)
grid_add(g_detail, l_price, 2, 0, 1, 1, 0.0, 0.5, 0, 1, 5, 5, 5, 5)
grid_add(g_detail, t_price, 3, 0, 1, 1, 0.1, 0.5, 1, 1, 5, 5, 5, 5)
grid_add(g_detail, b_save, 4, 0, 1, 1, 0.0, 0.5, 1, 1, 5, 5, 5, 5)

grid_add(g, g_detail, 0, 2, 3, 1, 1.0, 0.0, 3, 0, 5, 5, 5, 5)
add(g)

event(b_new, fn() {
    config(t_name, "contents", "")
    config(t_price, "contents", "")
    config(t_name, "focus", true)
})

reload()
title("Products")
closing("Are you sure you want to quit this application?", "Please confirm")
show()
```

Contoh: GUI dan Database

GUI dan Database: 76 baris

```
load_module("db_util")

var d = db_connect_embed("database_test")
if (d == null) {
    message("Cannot connect to database", "Error")
    exit()
}
db_create_table_embed(d, "products", [{"id", "id"}, {"name", "varchar."}, {"price", "decimal."}])

var reload = fn() {
    config(t, "contents", [])
    var r = query_result(db_select_all(d, "products"))
    var rr = []
    if (r != null) {
        each(r, fn(e, i) {
            var rr = rr + [e[0], e[1], number_group(e[2], ",", ".")]
        })
    }
    config(t, "contents", rr)
}

reset()
var g = component("grid", "")
var t = component("table", "ID, NAME, PRICE")
table_right(t, 0)
table_right(t, 2)
var b_new = component("button", "New")
var b_del = component("button", "Delete")
grid_add(g, t, 0, 0, 3, 1, 1.0, 1.0, 3, 0, 5, 5, 5, 5)
grid_add(g, b_new, 0, 1, 1, 1, 0.5, 0.0, 3, 0, 5, 5, 5, 5)
grid_add(g, b_del, 1, 1, 1, 1, 0.5, 0.0, 3, 0, 5, 5, 5, 5)
```

```
var g_detail = component("grid", "")
config(g_detail, "border", "Detail")
var l_name = component("label", "Name")
var t_name = component("text", "")
var l_price = component("label", "Price")
var t_price = component("text", "")
var b_save = component("button", "Save")
grid_add(g_detail, l_name, 0, 0, 1, 1, 0.0, 0.5, 0, 1, 5, 5, 5, 5)
grid_add(g_detail, t_name, 1, 0, 1, 1, 1.0, 0.5, 1, 1, 5, 5, 5, 5)
grid_add(g_detail, l_price, 2, 0, 1, 1, 0.0, 0.5, 0, 1, 5, 5, 5, 5)
grid_add(g_detail, t_price, 3, 0, 1, 1, 0.1, 0.5, 1, 1, 5, 5, 5, 5)
grid_add(g_detail, b_save, 4, 0, 1, 1, 0.0, 0.5, 1, 1, 5, 5, 5, 5)
```

```
grid_add(g, g_detail, 0, 2, 3, 1, 1.0, 0.0, 3, 0, 5, 5, 5, 5)
add(g)
```

```
event(b_new, fn() {
    config(t_name, "contents", "")
    config(t_price, "contents", "")
    config(t_name, "focus", true)
})
```

```
event(b_save, fn() {
    var n = trim(get(t_name, "contents"))
    var p = get(t_price, "contents")
    var pp = number(p)
    var fp = number_group(pp, ",", ".")
    if (empty(n)) {
        message("Please fill in product name", "Error")
    } else {
        var w = fp + newline() + words_en(p) + newline() + words_id(p)
        var x = n + newline() + w
        var conf = confirm("Are you sure you want to add: " + x , "Please Confirm")
        if (conf == "OK") {
            var res = db_insert(d, "products", {"name": n, "price": pp})
            reload()
        }
    }
})

reload()
title("Products")
closing("Are you sure you want to quit this application?", "Please confirm")
show()
```

Contoh: GUI dan Database

GUI dan Database: 90 baris

```
load_module("db_util")

var d = db_connect_embed("database_test")
if (d == null) {
    message("Cannot connect to database", "Error")
    exit()
}
db_create_table_embed(d, "products", [{"id", "id"}, {"name", "varchar."}, {"price", "decimal."}])

var reload = fn() {
    config(t, "contents", [])
    var r = query_result(db_select_all(d, "products"))
    var rr = []
    if (r != null) {
        each(r, fn(e, i) {
            var rr = rr + [e[0], e[1], number_group(e[2], ",", ".")]
        })
    }
    config(t, "contents", rr)
}

reset()
var g = component("grid", "")
var t = component("table", "ID, NAME, PRICE")
table_right(t, 0)
table_right(t, 2)
var b_new = component("button", "New")
var b_del = component("button", "Delete")
grid_add(g, t, 0, 0, 3, 1, 1.0, 1.0, 3, 0, 5, 5, 5, 5)
grid_add(g, b_new, 0, 1, 1, 1, 0.5, 0.0, 3, 0, 5, 5, 5, 5)
grid_add(g, b_del, 1, 1, 1, 1, 0.5, 0.0, 3, 0, 5, 5, 5, 5)

var g_detail = component("grid", "")
config(g_detail, "border", "Detail")
var l_name = component("label", "Name")
var t_name = component("text", "")
var l_price = component("label", "Price")
var t_price = component("text", "")
var b_save = component("button", "Save")
grid_add(g_detail, l_name, 0, 0, 1, 1, 0.0, 0.5, 0, 1, 5, 5, 5, 5)
grid_add(g_detail, t_name, 1, 0, 1, 1, 1.0, 0.5, 1, 1, 5, 5, 5, 5)
grid_add(g_detail, l_price, 2, 0, 1, 1, 0.0, 0.5, 0, 1, 5, 5, 5, 5)
grid_add(g_detail, t_price, 3, 0, 1, 1, 0.1, 0.5, 1, 1, 5, 5, 5, 5)
grid_add(g_detail, b_save, 4, 0, 1, 1, 0.0, 0.5, 1, 1, 5, 5, 5, 5)
```

```
grid_add(g, g_detail, 0, 2, 3, 1, 1.0, 0.0, 3, 0, 5, 5, 5, 5)
add(g)
```

```
event(b_new, fn() {
    config(t_name, "contents", "")
    config(t_price, "contents", "")
    config(t_name, "focus", true)
})
```

```
event(b_save, fn() {
    var n = trim(get(t_name, "contents"))
    var p = get(t_price, "contents")
    var pp = number(p)
    var fp = number_group(pp, ",", ".")
    if (empty(n)) {
        message("Please fill in product name", "Error")
    } else {
        var w = fp + newline() + words_en(p) + newline() + words_id(p)
        var x = n + newline() + w
        var conf = confirm("Are you sure you want to add: " + x , "Please Confirm")
        if (conf == "OK") {
            var res = db_insert(d, "products", {"name": n, "price": pp})
            reload()
        }
    }
})
```

```
event(b_del, fn() {
    var s = get(t, "active")
    if (s > -1) {
        var x = table_get_value(t, s, 0)
        var conf = confirm("Are you sure you want to delete: #" + x , "Please Confirm")
        if (conf == "OK") {
            db_delete(d, "products", {"id": x})
            reload()
        }
    } else {
        message("Please select a product", "Error")
    }
})
```

```
reload()
title("Products")
closing("Are you sure you want to quit this application?", "Please confirm")
show()
```

Contoh: GUI dan Database

GUI dan Database: Select / Insert / Delete

Products

| ID | NAME | PRICE |
|----|-----------|-------------|
| 1 | Product 1 | 12,345 |
| 2 | Product 2 | 123,456 |
| 3 | Product 3 | 1,234,567 |
| 4 | Product 4 | 12,345,678 |
| 5 | Product 5 | 123,456,789 |

Please Confirm

Are you sure you want to add: Product 6
1,234,567,890
One billion two hundred and thirty-four million five hundred and sixty-seven thousand eight hundred and ninety
Satu milyar dua ratus tiga puluh empat juta lima ratus enam puluh tujuh ribu delapan ratus sembilan puluh

OK

Cancel

New

Delete

Detail

Name

Product 6

Price

1234567890

Save

Sekali ditulis,
program yang
ditulis dengan
Singkong
dapat jalan di
sebanyak mungkin
sistem operasi
(terbaru ataupun
yang dirilis sekitar
25 tahun lalu)