# Aufgabe 2 - Liniendiagram

**Lösungsidee:**

Das Auslesen und speichern der gelesenen Werte wird vor aufrufen der Application durchgeführt. Danach wird der gelesene Titel für das neue Window verwendet und im Window die gelesenen Daten gespeichert. Im Konstruktor des Windows wird auch der höchste Wert ermittelt (hätte man auch schon in der Application machen können), da der sich beim neu zeichnen nie ändert.

Die gesamten Chart Kalkulationen und zeichnen passieren alles in der Draw Methode (mit mehr Zeitaufwand hätte man das auch aufteilen und optimieren können, da die Methode ziemlich groß geworden ist und teilweise redundanten Berechnungen ausgeführt werden), dafür wird anhand der Höhe und Breite des Fensters mit der Anzahl der Werten und dem höchsten Wert der Abstand der unterschiedlichen Werte am Screen berechnet damit danach die Achsen und Achsen Beschriftung so viel vom Screen einnimmt wie möglich. Nachdem werden die Werte eingetragen, dafür wird die y Position relativ zum Koordinaten Ursprung und Max Höhe gerechnet.

**Zeitaufwand:** ~2h

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**Code:**

```
program LineChart;

uses
  MetaInfo, OSBridge,
  MLObj, MLWin, MLAppl, MLVect, MLInt, MLColl;

type
  ChartType = (Simple, VerticalLines, HorizontalLines, GridLines);

  ChartWindow = ^ChartWindowObj;
  ChartWindowObj = object(MLWindowObj)
    data: MLVector;
    cType: ChartType;
    maxVal: integer;

    constructor Init(title: STRING; data: MLVector);
    destructor Done; virtual;
    (*overridden methods*)
    procedure Open; virtual;
    procedure Redraw; virtual;
    procedure OnCommand(commandNr: INTEGER); virtual;
    (*new methods*)
    procedure DrawChart;
    procedure ChangeChartType(cType: ChartType);
```

```
  end; (*OBJECT*)

  ChartApplication= ^ChartApplicationObj;
  ChartApplicationObj = object(MLApplicationObj)
    title: STRING;
    data: MLVector;

    constructor Init(name, filename: STRING);
    destructor Done; virtual;
    (*overridden methods*)
    procedure OpenNewWindow; virtual;
    procedure BuildMenus; virtual;
    (*new methods*)
    procedure ExtractDataFromFile(filename: STRING);
  end; (*OBJECT*)

var
  (*chart types:*)
  simpleLinesCommand, verticalLinesCommand, horizontalLinesCommand,
gridLinesCommand: INTEGER;


(*=== ChartWindow ===*)

function NewChartWindow(title: string; data: MLVector): ChartWindow;
var
  w: ChartWindow;
begin
  New(w, Init(title, data));
  NewChartWindow := w;
end; (*NewChartWindow*)

constructor ChartWindowObj.Init(title: STRING; data: MLVector);
var
  iterator: MLIterator;
  next: MLObject;
begin
  inherited Init(title);
  Register('ChartWindow', 'MLWindow');
  cType := Simple;
  self.data := data;

  maxVal := MLInteger(data^.GetAt(data^.Size))^.AsInteger;

  iterator := data^.NewIterator;
  next := iterator^.Next;
  maxVal := MLInteger(next)^.AsInteger;
  while next <> NIL do
  begin
```

```
    if (MLInteger(next)^.AsInteger > maxVal) then
      maxVal := MLInteger(next)^.AsInteger;
    next := iterator^.Next;
  end;
  maxVal := Round(maxVal / 100) + 1; // round up to nearest multiple of 100

  Dispose(iterator, Done);
end; (*ChartWindowObj.Init*)

destructor ChartWindowObj.Done;
begin
  Dispose(data, Done);
  inherited Done;
end; (*ChartWindowObj.Done*)

procedure ChartWindowObj.Open;
begin
  inherited Open;
  DrawChart;
end; (*ChartWindowObj.Open*)

procedure ChartWindowObj.Redraw;
begin
  DrawChart;
end; (*ChartWindowObj.Redraw*)

procedure ChartWindowObj.OnCommand(commandNr: INTEGER);
begin
  if commandNr = simpleLinesCommand then
    ChangeChartType(Simple)
  else if commandNr = verticalLinesCommand then
    ChangeChartType(VerticalLines)
  else if commandNr = horizontalLinesCommand then
    ChangeChartType(HorizontalLines)
  else if commandNr = gridLinesCommand then
    ChangeChartType(GridLines)
  else
    inherited OnCommand(commandNr);
end; (*ChartWindowObj.OnCommand*)

procedure ChartWindowObj.ChangeChartType(cType: ChartType);
begin
  DrawChart;
  self.cType := cType;
  DrawChart;
end; (*ChartWindowObj.ChangeChartType*)

procedure ChartWindowObj.DrawChart;
```

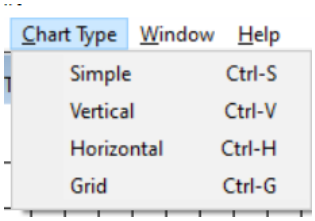
```
var
  currVal, horizontalGap, verticalGap, i: integer;
  origin, dummy1, dummy2: Point;
  curr, prev: Point;
  intStr: string;
begin
  horizontalGap := (Width - 80) div (data^.Size - 1);
  verticalGap := (Height - 50) div maxVal;

  origin.x := 50;
  origin.y := Height - 20;

  // draw axes
  dummy1.x := origin.x + horizontalGap * (data^.Size - 1);
  dummy1.y := origin.y;
  DrawLine(origin, dummy1, 1);

  dummy1.x := origin.x;
  dummy1.y := origin.y - verticalGap * maxVal;
  DrawLine(origin, dummy1, 1);

  // draw grid horizontal
  dummy1.x := origin.x - 30;
  dummy1.y := origin.y - 10;

  for i := 0 to maxVal do
  begin
    Str(i*100, intStr);
    DrawString(dummy1, intStr, 10);
    dummy1.y := dummy1.y - verticalGap;
  end;

  dummy2.x := origin.x + horizontalGap * (data^.Size - 1);
  dummy2.y := origin.y;

  dummy1.x := origin.x;
  dummy1.y := origin.y;

  if (cType = GridLines) or (cType = VerticalLines) then
    for i := 1 to maxVal do
    begin
      dummy1.y := dummy1.y - verticalGap;
      dummy2.y := dummy2.y - verticalGap;
      DrawLine(dummy1, dummy2, 1);
    end;

  // draw grid vertical
  dummy1.x := origin.x - 2;
```

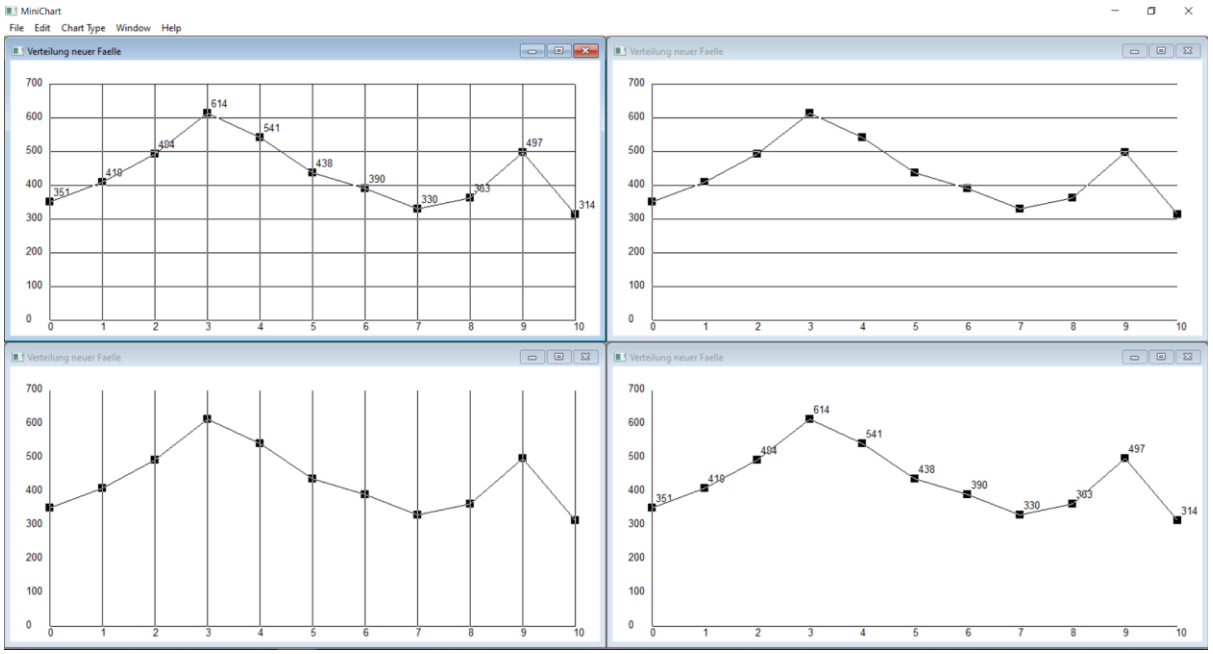
```
  dummy1.y := origin.y;

  for i := 0 to data^.Size - 1 do
  begin
    Str(i, intStr);
    DrawString(dummy1, intStr, 10);
    dummy1.x := dummy1.x + horizontalGap;
  end;

  dummy2.x := origin.x;
  dummy2.y := origin.y - verticalGap * maxVal;

  dummy1.x := origin.x;
  dummy1.y := origin.y;

  if (cType = GridLines) or (cType = HorizontalLines) then
    for i := 1 to data^.Size do
    begin
      dummy1.x := dummy1.x + horizontalGap;
      dummy2.x := dummy2.x + horizontalGap;
      DrawLine(dummy1, dummy2, 1);
    end;

  // draw values
  prev.x := 0;
  prev.y := 0;
  curr.x := origin.x;
  for i := 1 to data^.Size do
  begin
    currVal := MLInteger(data^.GetAt(i))^.AsInteger;
    curr.y := origin.y - Round((currVal / (maxVal * 100)) * maxVal *
verticalGap);

    dummy1.x := curr.x - 5;
    dummy1.y := curr.y - 5;
    DrawFilledRectangle(dummy1, 10, 10);

    if i <> 1 then
      DrawLine(prev, curr, 1);

    if (cType = Simple) or (cType = GridLines) then
    begin
      Str(currVal, intStr);
      dummy1.x := curr.x + 5;
      dummy1.y := curr.y - 20;
      DrawString(dummy1, intStr, 10);
    end;
    prev := curr;
```

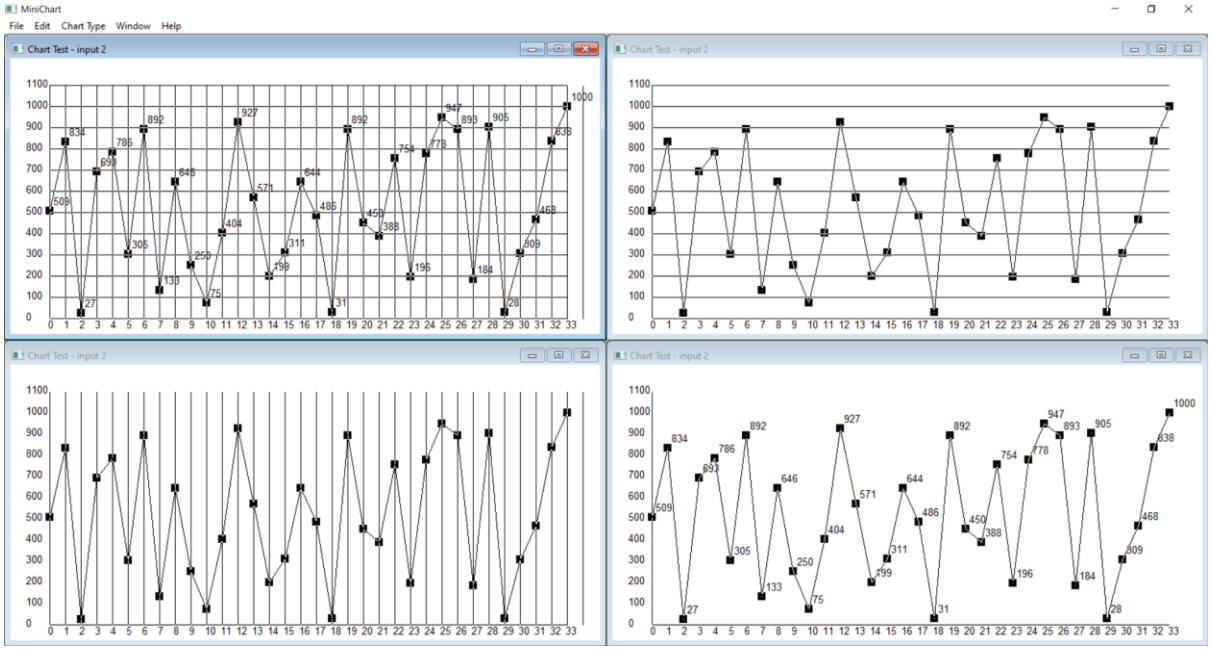
```
    curr.x := curr.x + horizontalGap;
  end;
end; (*ChartWindowObj.DrawChart*)

(*=== ChartApplication ===*)

function NewChartApplication(filename: string): ChartApplication;
var
  a: ChartApplication;
begin
  New(a, Init('MiniChart', filename));
  NewChartApplication := a;
end; (*NewChartApplication*)

constructor ChartApplicationObj.Init(name, filename: STRING);
begin
  inherited Init(name);
  Register('ChartApplication', 'MLApplication');
  ExtractDataFromFile(filename);
end; (*ChartApplicationObj.Init*)

destructor ChartApplicationObj.Done;
begin
  inherited Done;
end; (*ChartApplicationObj.Done*)

procedure ChartApplicationObj.OpenNewWindow;
begin
  NewChartWindow(title, data)^.Open;
end; (*ChartApplicationObj.OpenNewWindow*)

procedure ChartApplicationObj.BuildMenus;
begin
  (*chart types menu:*)
  simpleLinesCommand  := NewMenuCommand('Chart Type', 'Simple',  's');
  verticalLinesCommand := NewMenuCommand('Chart Type',  'Vertical', 'v');
  horizontalLinesCommand  := NewMenuCommand('Chart
Type',  'Horizontal',  'h');
  gridLinesCommand  := NewMenuCommand('Chart Type',  'Grid',  'g');
end; (*ChartApplicationObj.BuildMenus*)

procedure ChartApplicationObj.ExtractDataFromFile(filename: STRING);
var
  inFile: TEXT;
  line: string;
  value: integer;
begin
  assign(inFile, filename);
```

```
  reset(inFile);

  data := NewMLVector;

  if not eof(inFile) then
    readln(inFile, title);

  while not eof(inFile) do
  begin
    readln(inFile, line);
    Val(line, value);
    data^.Add(NewMLInt(value));
  end;
end; (*ChartApplicationObj.ExtractDataFromFile*)

(*=== main program ===*)

var
  a: ChartApplication;
  filename: string;

begin (*Chart1*)
  write('Enter input filename: '); ReadLn(filename);
  a := NewChartApplication(filename);
  a^.Run;
  Dispose(a, Done);
  WriteMetaInfo;
end. (*Chart1*)
```

## Tests:




*(input files are in the zip)*