Article

Several digital timers and clocks for desktop computers

WenJun Zhang
School of Life Sciences, Sun Yat-sen University, Guangzhou, China
E-mail: zhwj@mail.sysu.edu.cn, wjzhang@iaees.org

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Abstract
Several digital timers and clocks for desktop computers were developed in present study. Digital timers are used for time control in scientific experiments, dissertation defensing, work debriefing, academic lecture, student teaching, etc. Digital timer-counter and clocks are used for field sampling, field observation, ecological experiments, etc. All digital timers and clocks were packed and can be freely downloaded.

Keywords digital timer; digital clock; desktop software.

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1 Introduction

Computer software are generally neceaary for biological and ecological studies (Chen, 2013; Dijak, 2013; Garcia, 2014; Armstrong et al., 2017; Zhang, 2012a, 2020, 2021a, 2022, 2024a-d; Zhang et al., 2015, 2017, 2023).

In present study, I developed a set of digital timers and clocks for desktop computers, among which digital timers are expected to be used for time control in scientific experiments, dissertation defensing, work debriefing, academic lecture, student teaching, etc., and digital timer-counter and clocks are used for field sampling, field observation, ecological experiments, etc. All digital timers and clocks can be freely downloaded.

2 Software Development

The digital timers and clocks (Figs 2-5) were developed using Delphi (Fig. 1). The following are Delphi codes for one of the main digital timers (Timer.exe; Fig. 2):

```
unit Unit1;

interface
```

```
uses
  Windows, Messages, SysUtils, Classes, Graphics, Controls, Forms, Dialogs,
  StdCtrls, ExtCtrls;

type
  TForm1 = class(TForm)
    Timer1: TTimer;
    Panel1: TPanel;
    Start: TButton;
    ListBox1: TListBox;
    ListBox2: TListBox;
    Label1: TLabel;
    Label2: TLabel;
    Label3: TLabel;
    Label4: TLabel;
    ListBox3: TListBox;
    CheckBox1: TCheckBox;
    procedure FormCreate(Sender: TObject);
    procedure Timer1Timer(Sender: TObject);
    procedure StartClick(Sender: TObject);
  private
    { Private declarations }
  public
    { Public declarations }
  end;

var
  Form1: TForm1;
  startt,t,ts: TDateTime;
  hours,minutes,seconds: Word;
  lab,sig: Integer;

implementation

uses Unit2;

{$R *.DFM}

procedure TForm1.FormCreate(Sender: TObject);
begin
listbox1.Selected[0]:=true;
listbox2.Selected[0]:=true;
listbox3.Selected[0]:=true;
lab:=0;
end;
```

```
procedure TForm1.Timer1Timer(Sender: TObject);
begin
if (lab=1) then
begin
t:=Now-startt;
form2.Panel1.Caption:=TimeToStr(ts-t);
form2.Panel1.Color:=clNone;
sig:=sig+1;
if (((ts-t)>=encodetime(0,5,0,0)) and ((ts-t)<encodetime(0,5,1,0)) and (checkbox1.checked=true)) then windows.beep(840,100);
if (((ts-t)>=encodetime(0,3,0,0)) and ((ts-t)<encodetime(0,3,1,0)) and (checkbox1.checked=true)) then windows.beep(840,100);
if (((ts-t)>=encodetime(0,1,0,0)) and ((ts-t)<encodetime(0,1,1,0)) and (checkbox1.checked=true)) then windows.beep(840,100);
if (((ts-t)>=encodetime(0,0,15,0)) and ((ts-t)<encodetime(0,0,16,0)) and (checkbox1.checked=true)) then
windows.beep(840,100);
if (((ts-t)<=encodetime(0,5,0,0)) and ((ts-t)>=encodetime(0,4,56,0))) then
begin
if (trunc(sig/2)=sig/2) then form2.Panel1.Color:=clyellow
else form2.Panel1.Color:=clred;
end;
if (((ts-t)<=encodetime(0,3,0,0)) and ((ts-t)>=encodetime(0,2,56,0))) then
begin
if (trunc(sig/2)=sig/2) then form2.Panel1.Color:=clyellow
else form2.Panel1.Color:=clred;
end;
if (((ts-t)<=encodetime(0,1,0,0)) and ((ts-t)>=encodetime(0,0,56,0))) then
begin
if (trunc(sig/2)=sig/2) then form2.Panel1.Color:=clyellow
else form2.Panel1.Color:=clred;
end;
if (((ts-t)<=encodetime(0,0,15,0)) and (trunc(sig/2)=sig/2)) then form2.Panel1.Color:=clred;
if (((ts-t)<=encodetime(0,0,15,0)) and (trunc(sig/2)<>sig/2)) then form2.Panel1.Color:=clyellow;
if (t>=ts) then
begin
form1.caption:='Timer – Zhang WJ (wjzhang@iaees.org)';
form1.formstyle:=fsstayontop;
form1.position:=poscreencenter;
panel1.color:=clred;
panel1.caption:='STOP';
form1.width:=400;
form1.height:=250;
if (checkbox1.checked=true) then windows.beep(840,500);
form1.visible:=true;
form2.visible:=false;
lab:=0;
end;
```

```
end;
end;

procedure TForm1.StartClick(Sender: TObject);
begin
hours:=listbox1.itemindex+1;
minutes:=listbox2.itemindex+1;
seconds:=listbox3.itemindex+1;
if (hours=0) then hours:=1;
if (minutes=0) then minutes:=1;
if (seconds=0) then seconds:=1;
ts:=encodetime(hours-1,minutes-1,seconds-1,0);
form2.formstyle:=fsstayontop;
startt:=Now;
form2.Panel1.Caption:=TimeToStr(Now-startt);
form2.visible:=true;
form1.visible:=false;
listbox1.visible:=false;
listbox2.visible:=false;
listbox3.visible:=false;
label1.visible:=false;
label2.visible:=false;
label3.visible:=false;
label4.visible:=false;
checkbox1.visible:=false;
Start.visible:=false;
panel1.align:=alclient;
lab:=1;
sig:=1;
end;

end.



unit Unit2;

interface

uses
  Windows, Messages, SysUtils, Variants, Classes, Graphics, Controls, Forms,
  Dialogs, ExtCtrls;

type
  TForm2 = class(TForm)
    Panel1: TPanel;
  private
    { Private declarations }
  public
    { Public declarations }
  protected
    procedure CreateParams(var Params: TCreateParams); override;

  end;

var
  Form2: TForm2;

implementation

{$R *.dfm}

procedure TForm2.CreateParams(var Params: TCreateParams);
begin
inherited;
Params.WndParent:=0;
end;

end.
```

The following are Delphi codes for another digital timer (Timer-X.exe, Fig. 3):

```
unit Unit1;

interface

uses
  Windows, Messages, SysUtils, Classes, Graphics, Controls, Forms, Dialogs,
  StdCtrls, ExtCtrls;

type
  TForm1 = class(TForm)
    Timer1: TTimer;
    Panel1: TPanel;
    Start: TButton;
    Button1: TButton;
    ListBox1: TListBox;
    ListBox2: TListBox;
    Label1: TLabel;
    Label2: TLabel;
    Label3: TLabel;
```

```
      Label4: TLabel;
      ListBox3: TListBox;
      CheckBox1: TCheckBox;
      procedure FormCreate(Sender: TObject);
      procedure Timer1Timer(Sender: TObject);
      procedure StartClick(Sender: TObject);
      procedure Button1Click(Sender: TObject);
   private
      { Private declarations }
   public
      { Public declarations }
   end;

var
   Form1: TForm1;
   startt,t,ts: TDateTime;
   hours,minutes,seconds: Word;
   lab,sig: Integer;

implementation

{$R *.DFM}

procedure TForm1.FormCreate(Sender: TObject);
begin
startt:=Now;
t:=Now-startt;
Panel1.Caption:=TimeToStr(t);
listbox1.Selected[0]:=true;
listbox2.Selected[0]:=true;
listbox3.Selected[0]:=true;
button1.enabled:=false;
lab:=0;
end;
procedure TForm1.Timer1Timer(Sender: TObject);
begin
if (lab=1) then
begin
t:=Now-startt;
Panel1.Caption:=TimeToStr(ts-t);
sig:=sig+1;
if (((ts-t)>=encodetime(0,5,0,0)) and ((ts-t)<encodetime(0,5,1,0)) and (checkbox1.checked=true)) then windows.beep(840,100);
if (((ts-t)>=encodetime(0,3,0,0)) and ((ts-t)<encodetime(0,3,1,0)) and (checkbox1.checked=true)) then windows.beep(840,100);
if (((ts-t)>=encodetime(0,1,0,0)) and ((ts-t)<encodetime(0,1,1,0)) and (checkbox1.checked=true)) then windows.beep(840,100);
if (((ts-t)>=encodetime(0,0,15,0)) and ((ts-t)<encodetime(0,0,16,0)) and (checkbox1.checked=true)) then
```

```
windows.beep(840,100);
if (((ts-t)<=encodetime(0,5,1,0)) and ((ts-t)>=encodetime(0,4,59,0))) then
begin
if (trunc(sig/2)=sig/2) then Panel1.Color:=clyellow
else Panel1.Color:=clred;
end;
if ((ts-t)<=encodetime(0,4,58,0)) then Panel1.Color:=claqua;
if (((ts-t)<=encodetime(0,3,1,0)) and ((ts-t)>=encodetime(0,2,59,0))) then
begin
if (trunc(sig/2)=sig/2) then Panel1.Color:=clyellow
else Panel1.Color:=clred;
end;
if ((ts-t)<=encodetime(0,2,58,0)) then Panel1.Color:=claqua;
if (((ts-t)<=encodetime(0,1,1,0)) and ((ts-t)>=encodetime(0,0,59,0))) then
begin
if (trunc(sig/2)=sig/2) then Panel1.Color:=clyellow
else Panel1.Color:=clred;
end;
if ((ts-t)<=encodetime(0,0,58,0)) then Panel1.Color:=claqua;
if (((ts-t)<=encodetime(0,0,16,0)) and (trunc(sig/2)=sig/2)) then Panel1.Color:=clred;
if (((ts-t)<=encodetime(0,0,16,0)) and (trunc(sig/2)<>sig/2)) then Panel1.Color:=clyellow;
if (t>=ts) then
begin
form1.position:=poscreencenter;
panel1.color:=clred;
panel1.caption:='STOP';
form1.formstyle:=fsstayontop;
listbox1.enabled:=true;
listbox2.enabled:=true;
listbox3.enabled:=true;
listbox1.Selected[0]:=true;
listbox2.Selected[0]:=true;
listbox3.Selected[0]:=true;
Start.enabled:=true;
button1.enabled:=false;
if (checkbox1.checked=true) then windows.beep(840,500);
lab:=0;
end;
end;
end;

procedure TForm1.StartClick(Sender: TObject);
begin
panel1.color:=claqua;
hours:=listbox1.itemindex+1;
```

```
minutes:=listbox2.itemindex+1;
seconds:=listbox3.itemindex+1;
if (hours=0) then hours:=1;
if (minutes=0) then minutes:=1;
if (seconds=0) then seconds:=1;
ts:=encodetime(hours-1,minutes-1,seconds-1,0);
listbox1.enabled:=false;
listbox2.enabled:=false;
listbox3.enabled:=false;
button1.enabled:=true;
Start.enabled:=false;
startt:=Now;
Panel1.Caption:=TimeToStr(Now-startt);
form1.formstyle:=fsnormal;
sig:=1;
lab:=1;
end;

procedure TForm1.Button1Click(Sender: TObject);
begin
listbox1.enabled:=true;
listbox2.enabled:=true;
listbox3.enabled:=true;
listbox1.Selected[0]:=true;
listbox2.Selected[0]:=true;
listbox3.Selected[0]:=true;
button1.enabled:=false;
Start.enabled:=true;
startt:=now;
Panel1.Caption:=TimeToStr(now-startt);
lab:=0;
end;

end.
```

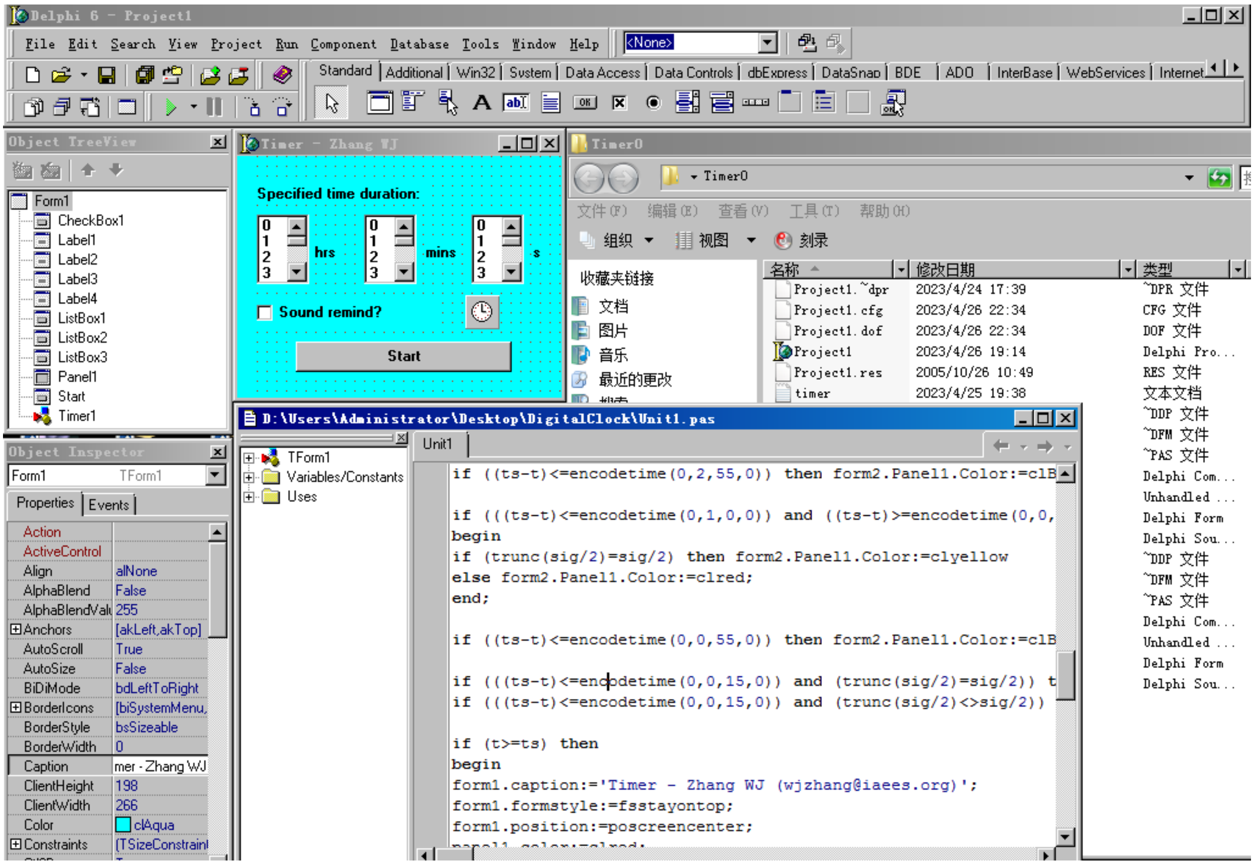
The following are Delphi codes for timer-counter (Fig. 4):

```
unit newTimer;

interface

uses
  Windows, Messages, SysUtils, Variants, Classes, Graphics, Controls, Forms,
  Dialogs, StdCtrls, ExtCtrls;
```

```
type
  TForm1 = class(TForm)
    Panel1: TPanel;
    Timer1: TTimer;
    Button1: TButton;
    Button2: TButton;
    procedure FormCreate(Sender: TObject);
    procedure Button2Click(Sender: TObject);
    procedure Button1Click(Sender: TObject);
    procedure Timer1Timer(Sender: TObject);
  private
    { Private declarations }
  public
    { Public declarations }
  end;

var
  Form1: TForm1;
  startt:Tdatetime;
  lab: Integer;

implementation

{$R *.dfm}

procedure TForm1.FormCreate(Sender: TObject);
begin
startt:=now;
Panel1.Caption:=TimeToStr(Now-startt);
button2.enabled:=false;
end;

procedure TForm1.Button2Click(Sender: TObject);
begin
button2.enabled:=false;
button1.enabled:=true;
lab:=0;
end;

procedure TForm1.Button1Click(Sender: TObject);
begin
button1.enabled:=false;
button2.enabled:=true;
startt:=now;
lab:=1;
```

```
end;

procedure TForm1.Timer1Timer(Sender: TObject);
begin
if (lab=1) then
begin
Panel1.Caption:=TimeToStr(Now-startt);
end;
end;

end.
```

All digital timers and clocks are packed in a file and can be downloaded at: http://www.iaees.org/publications/journals/ces/articles/2024-14(1)/e-suppl/Zhang-Supplementary-Material.rar



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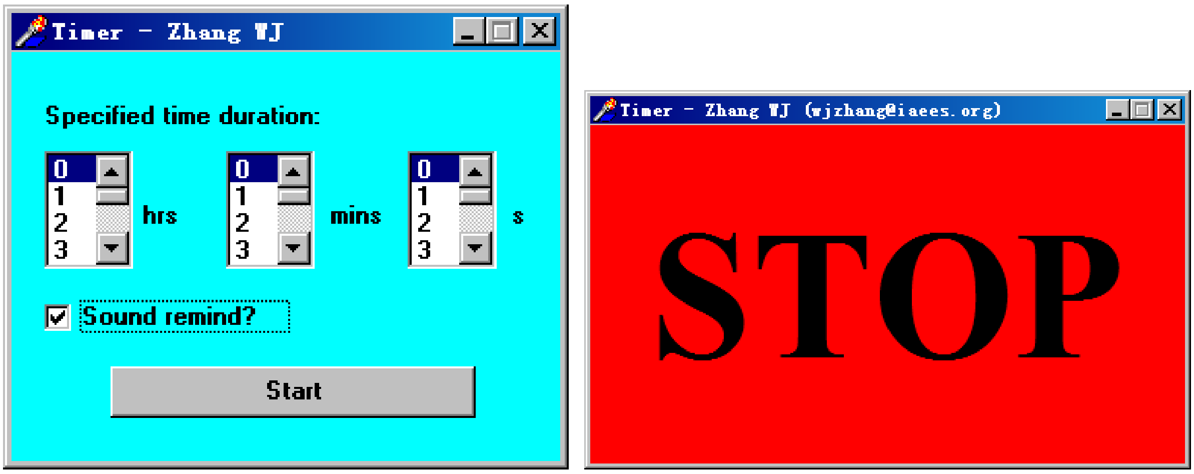
Project1.~dpr	2023/4/24 17:39	~DPR 文件
Project1.cfg	2023/4/26 22:34	CFG 文件
Project1.dof	2023/4/26 22:34	DOF 文件
Project1	2023/4/26 19:14	Delphi Pro...
Project1.res	2005/10/26 10:49	RES 文件
timer	2023/4/25 19:38	文本文档
		~DDP 文件
		~DFM 文件
		~PAS 文件
		Delphi Com...
		Unhandled ...
		Delphi Form
		Delphi Sou...
		~DDP 文件
		~DFM 文件
		~PAS 文件
		Delphi Com...
		Unhandled ...
		Delphi Form
		Delphi Sou...

Action	
ActiveControl	
Align	alNone
AlphaBlend	False
AlphaBlendVal	255
⊞Anchors	[akLeft,akTop]
AutoScroll	True
AutoSize	False
BiDiMode	bdLeftToRight
⊞BorderIcons	[biSystemMenu,
BorderStyle	bsSizeable
BorderWidth	0
Caption	mer - Zhang WJ
ClientHeight	198
ClientWidth	266
Color	clAqua
⊞Constraints	(TSizeConstraint

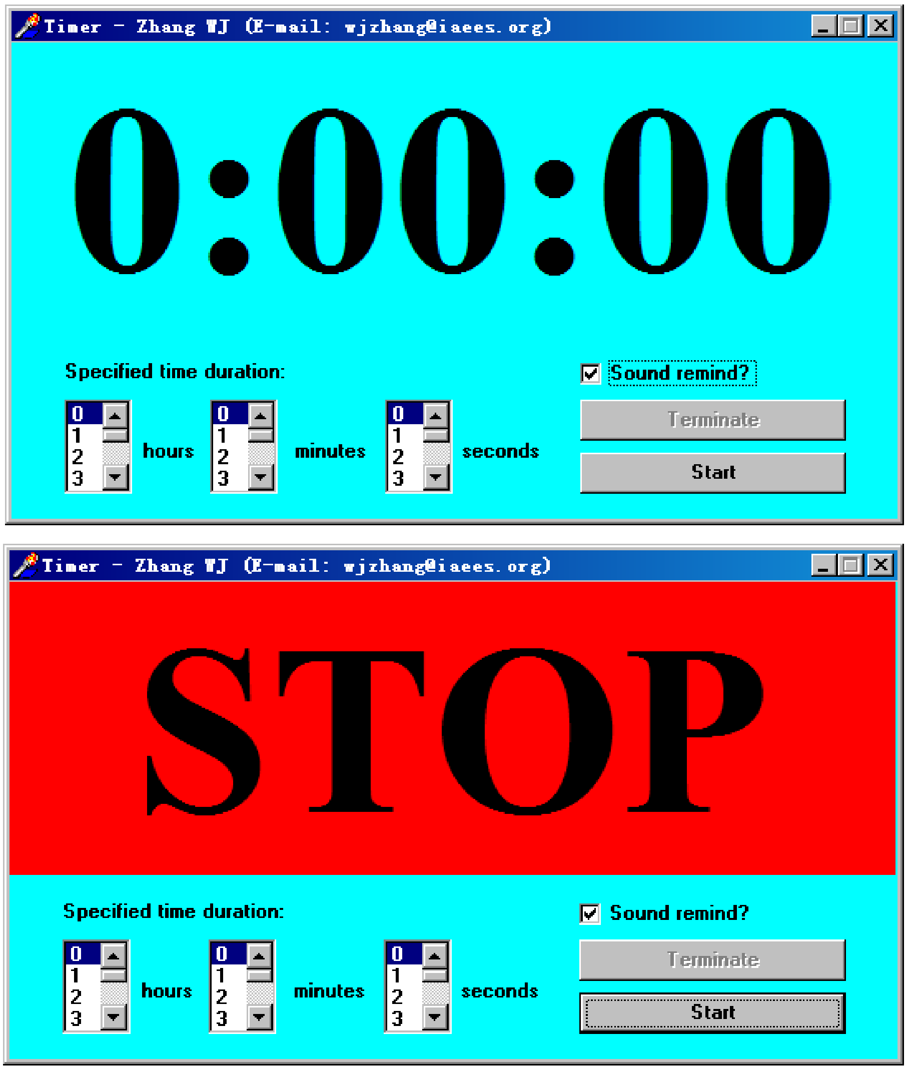
```
if ((ts-t)<=encodetime(0,2,55,0)) then form2.Panel1.Color:=clB

if (((ts-t)<=encodetime(0,1,0,0)) and ((ts-t)>=encodetime(0,0,
begin
if (trunc(sig/2)=sig/2) then form2.Panel1.Color:=clyellow
else form2.Panel1.Color:=clred;
end;

if ((ts-t)<=encodetime(0,0,55,0)) then form2.Panel1.Color:=clB

if (((ts-t)<=encodetime(0,0,15,0)) and (trunc(sig/2)=sig/2)) t
if (((ts-t)<=encodetime(0,0,15,0)) and (trunc(sig/2)<>sig/2))

if (t>=ts) then
begin
form1.caption:='Timer - Zhang WJ (wjzhang@iaees.org)';
form1.formstyle:=fsstayontop;
form1.position:=poscreencenter;
```

Fig. 1 The Delphi environment for developing digital timers and clocks.



☑ Sound remind?

Fig. 2 The interfaces of the digital timer, Timer.exe.



☑ Sound remind?

☑ Sound remind?

Fig. 3 The interfaces of the digital timers, Timer-1.exe and Timer-2.exe.

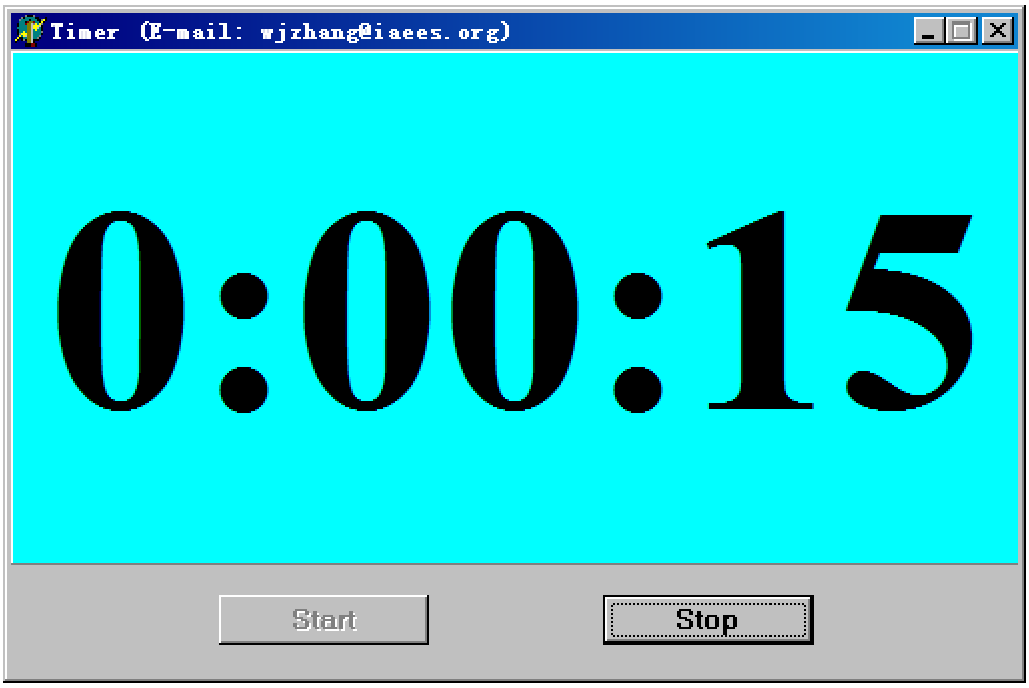


Fig. 4 The interfaces of the digital timer-counter, Timer-Counter.exe.

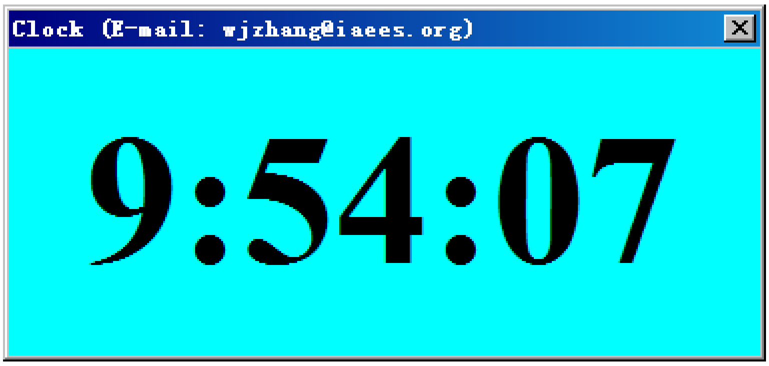


Fig. 5 The interfaces of the digital clocks, Clock-1.exe, Clock-2.exe.

3 Applications

Digital timers are used for time control in scientific experiments, dissertation defensing, work debriefing, academic lecture, student teaching, etc. Digital timer-counter and clocks are used for field sampling, field observation, ecological experiments, etc.

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