Shared Phidgets

Rapidly Prototyping
Distributed Physical User Interfaces

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Outline

1. Introduction, Architecture
2. Demos
3. Conclusion, Future Work
Introduction

Shared Phidgets – A Developer Toolkit for Rapidly Prototyping Distributed Physical User Interfaces
Architecture

Development using the Shared Phidgets .NET Component Library (Details: see Figure 2)

End-user software using Physical Interaction Devices

Physical Device Interaction
- InterfaceKit
- TexILCD
- Servo Motor
- RFID Reader
- InterfaceKit

Phidget Devices (USB connected)
- InterfaceKit
- TexILCD
- Servo Motor
- RFID Reader
- InterfaceKit

Connector

Server (Shared Dictionary)
- Wired or Wireless Network Connections

Shared Data Space, using a Shared Dictionary

High-level Tools: Control and Observe Devices and Network
- Device Browser
- Device Controller
- Network Controller

SharedPhidgets Library Components
- Custom Developer Code

SharedPhidgets Library Components
- Custom Developer Code

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Connecting Phidgets

Phidget Devices (USB connected)
- InterfaceKit
- TextLCD
- Servo Motor

Server (Shared Dictionary)
- Wired or Wireless Network

End-user software using Physical Interaction Devices
- SharedPhidgets Library Components
- Custom Developer Code

Development using the Shared Phidgets .NET Component Library (Details: see Figure 2)
- SharedPhidgets Library Components
- Custom Developer Code

High-level Tools: Control and Observe Devices and Network
- Device Browser
- Device Controller
- Network Controller

Shared Data Space, using a Shared Dictionary
- InterfaceKit
- Phidgets Inc. Web Service
- RFID Reader

Physical Device Interaction
- Users
- Connectors
Connecting Phidgets
Connecting Phidgets
Connecting Phidgets
Connecting Phidgets

```
\sharedphidgets
  \phidgetservo418
    \servoposition0 56
    \setservoposition0 73
    \motorcount 1
    \version 2.00
    \attached true
    \attacheddate 1/30/2006 9:39:41 PM
  \location MS 671
  \owner GroupLab
  \ip 136.159.x.xxx
  \keywords Homespac,
\phidgetinterfacekit2501
  \input0 265
  \input1 744
  \input2 12
  [...]
```
Phidgets Inc. Web Services

Development using the Shared Phidgets .NET Component Library (Details: see Figure 2)

End-user software using Physical Interaction Devices

Shared Data Space, using a Shared Dictionary

High-level Tools: Control and Observe Devices and Network

Device Browser

Device Controller

Network Controller
Observe, Control, Simulate
Observe, Control, Simulate

View, modify, add and delete dictionary entries
Observe, Control, Simulate

View, modify, add and delete dictionary entries

View and control available Phidget devices
Developer Toolkit

High-level Tools: Control and Observe Devices and Network

Device Browser
Device Controller
Network Controller

Shared Data Space, using a Shared Dictionary

Server (Shared Dictionary)

Wired or Wireless Network Connections

Physical Device Interaction

Phidget Devices (USB connected)

InterfaceKit
TextLCD
Servo Motor
RFID Reader
InterfaceKit
Phidgets Inc. Web Service
Phidgets Inc. Web Service
Connector
Connector

Development using the Shared Phidgets .NET Component Library (Details: see Figure 2)

SharedPhidgets Library Components
Custom Developer Code

SharedPhidgets Library Components
Custom Developer Code

End-user software using Physical Interaction Devices
Developer Toolkit

Development using the Shared Phidgets .NET Component Library

1. Application Development using Interface Skins
   - Connection Manager
   - Phidget Objects
   - Interface Skins

2. Application Development using Phidget Objects
   - Connection Manager
   - Phidget Objects
   - Custom Interface Design Elements

3. Application Development using Shared Dictionary
   - Shared Dictionary
   - Subscriptions
   - Custom Code Handling Dictionary Entries
   - Custom Interface Design Elements

Applications

See Figure 1 for Details.
Developer Toolkit

Visual Studio.NET Toolbox

Interface Skins for Interface Kit

Interface Skins for RFID Reader
Example A: Servo Control - Using the Interface Skin

```csharp
1. public Form1() {
2.   ConnectionManager connectionManager = new ConnectionManager();
3.   connectionManager.connectionManagerURL = "http://136.159.xx.xx:sp";
4.   Servo servo = new Servo();
6.   connectionManager.connectionManagerURL = "http://136.159.xx.xx:sp";
7.   this.Controls.Add(this.servoSkin);
8.   // Other code...
9. }
```

Example B: "Hello World" - Using the RFID and TextLCD Components

```csharp
1. private TextLCD textLCD;
2. public Form1() {
3.   ConnectionManager connectionManager = new ConnectionManager();
4.   connectionManager.connectionManagerURL = "http://136.159.xx.xx:sp";
5.   RFID rfid = new RFID();
6.   rfid.FilterSerialNumbers.Add(6937);
7.   rfid.Tag += new RFIDTagEventHandler(rfid_Tag);
8.   this.textLCD = new TextLCD();
9.   this.textLCD.FilterSerialNumbers.Add(2350); }
10. private void rfid_Tag(object sender, RFIDTagEventArgs e) {
11.   if(e.Tag == "01D2aabc05") this.textLCD.Display = "Hello World!";
12.   else this.textLCD.Display = "-"; }
```

Example C: The Average Temperature – Using Only Shared Dictionary

```csharp
1. public Form1() {
3.   InitializeComponents();
4.   this.timer_Tick += new System.EventHandler(this.timer_Tick);
5.   connectionManager.connectionManagerURL = "http://136.159.xx.xx:sp";
6.   this.sharedDictionary = connectionManager.getSharedDictionary();
7.   // Other code...
8.   
9.   private void timer_Tick(object sender, System.EventArgs e) {
10.      double averageTemperature = 0.0;
11.      counter = 0.0;
12.      foreach(SharedDictionary.Entry i in
13.       (this.sharedDictionary["/sharedphidgets/phidgetinterfacelink/7/sensor/3"] as IEnumerable)) {
14.         counter += i;
15.         averageTemperature += (int)i.Value / 4.0;
16.      }
17.      this.textBox.Text = "Average Temperature: " + (averageTemperature / counter) + " °C";
18.   }
```

Control the Servo

Correct RFID Tag → "Hello World"

The Temperature Display

Average Temperature: 25.43 °C
Using the Shared Phidgets Maps
Summary

Architecture and tools to share local Phidgets

Tools to observe, control and simulate

Developer toolkit for VisualStudio.NET

Example applications using the architecture and toolkit
Future Work

• Fully integration of all Phidget devices
• Adaptation to the changing beta versions of the Phidgets Inc. web services

• Development of other applications and tools
• More tutorials for the cookbook
• Complete API documentation
Getting Started

The iLab Cookbook: Download, Tutorials, Examples

Thank you for your attention!

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