Game Teleporter
A Development Tool For Everyone

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Outline

- Background
- Overview
- Definitions
- Study
- Methodology
- Conclusion/Questions

Who Am I?

- BSEE Purdue University

- Platform Architect - Bally Technologies
  - Design Class 2 (Bingo) Games For Tribal Casinos

UNR Projects

- Ambient Displays Of User Mood
  - Predicted Mood Of A User And Displayed On A Screen
  - If Prediction Was Wrong, User Could Press A Button
  - C4.5 Was Used To Do The Predicting
  - Looked At Movement, And Keyboard And Mouse Movements
  - Predicted Whether I Was Thinking Or Content
  - Predicted OK For Me, Probably Not OK For Others

UNR Projects

- Ambient Displays Of User Mood

UNR Projects

- Computer Generated Tic Tac Toe Player
  - Co-Evolution And Neural Networks To Create Player
  - Inputs To Neural Net – Board Positions
  - Inputs To Neural Net – Whose Turn
  - Output - What Square To Place Token
  - Evolved Against MiniMax Perfect Player
  - Evolved Player As Good As MiniMax Perfect Player
  - Co-Evolved Player As Good As MiniMax Perfect Player

UNR Projects

- SP2000 RoboGolf Competitor
- Collect Golf Balls And Return Them To The Goal Located In The Center Of The Ring
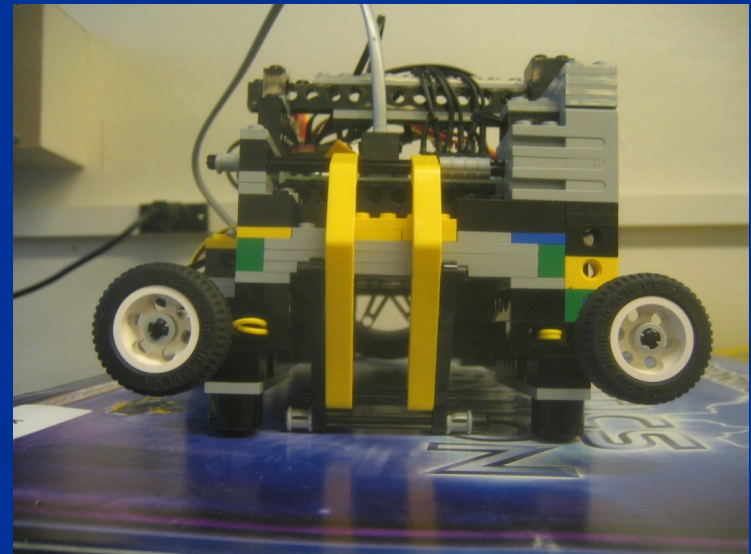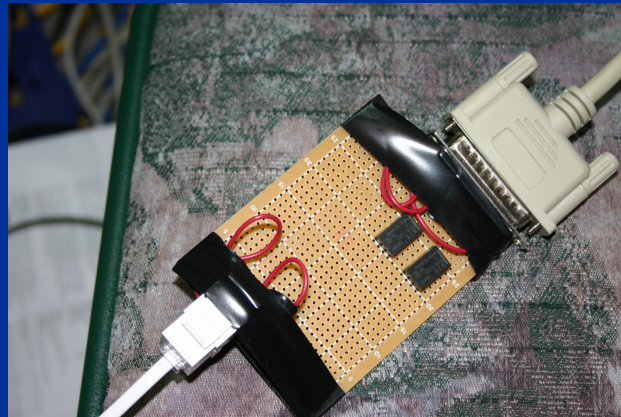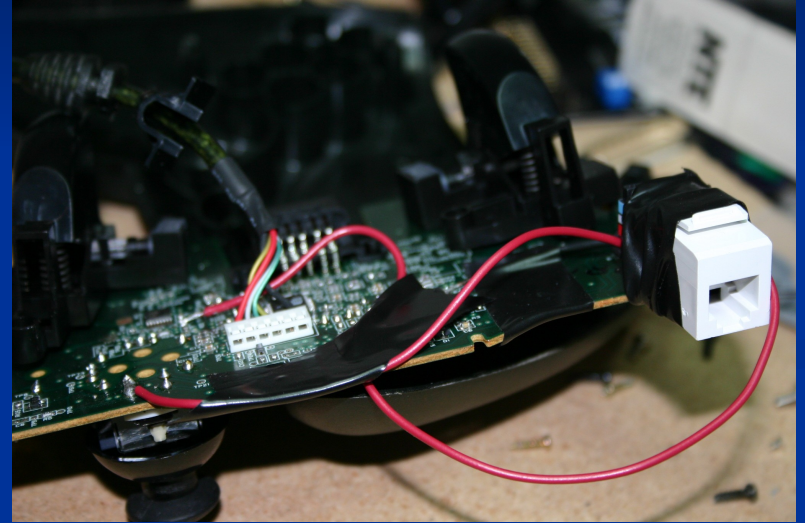
UNR Projects

- Detecting Motion In Video Games
  - Control A Video Game System From Computer
  - Look At 3 Sequential Frames
  - Subtract Each One To Identify Motion
  - Move Character Based On Objects In Path
  - Control Through Parallel Port
  - Worked, But To Slow To Be Useful

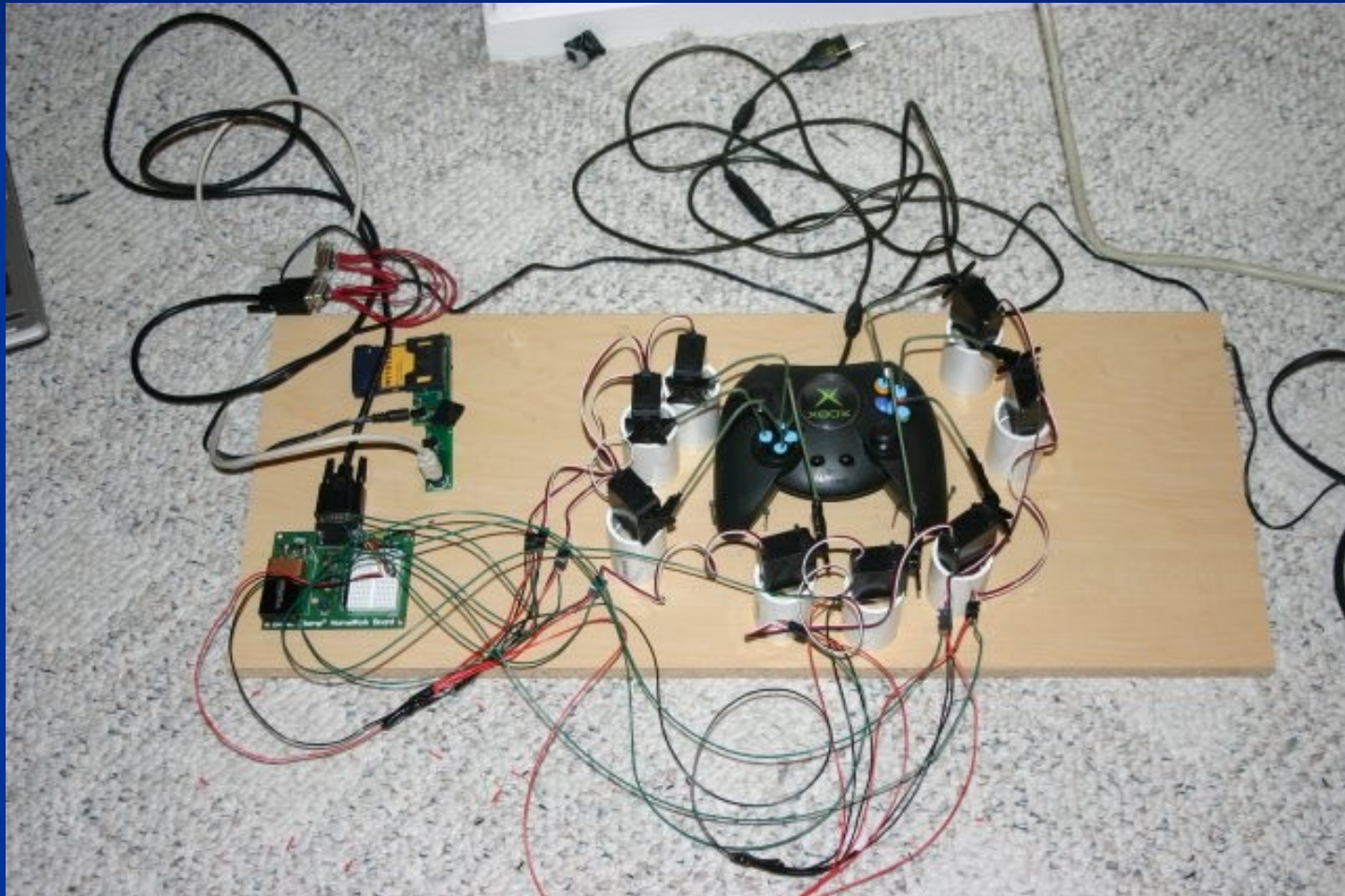# UNR Projects

- Detecting Motion In Video Games

UNR Projects

- Xbox Controller Controller
  - Control An Xbox From Anywhere Without Opening An Xbox Controller
  - TCP/IP Protocol From Controlling Device (Playstation Portable) To Controller
  - Gumstix Received Commands Sent Them Via Serial To Basic Stamp 2 Which Controlled Servos

UNR Projects

- Xbox Controller Controller

UNR Projects

- Cross Platform Multiplayer Game
  - Play A Game On A Playstation Portable Against Someone Playing The Same Game On A Nintendo DS
  - Simple Idea Difficult To Implement
  - Both Support C Compilers – However Many Differences
  - How To Display An Image, Get Input, And Play A Sound Different On Each Target

UNR Projects

- Cross Platform Multiplayer Game

- Need To Make This Easier To Develop

Motivation

- Creating A Game On Multiple Platforms Should Be Easier

- Tool Could Be Used For Education As Well

- Flexible Development Environment Should Allow Developers To Develop Exactly How They Want For Whatever Platform They Need

Overview

- The Game Teleporter Sets Up The Framework For Easy Multiplatform Development
- Great Tool For Educational Purposes
  - Easier To Generate Programs
  - Easier To Learn New Development Environments
  - Easier To Learn New Target Platforms

Definitions

- Development Environment
  - A Way Of Creating A Program
  - Adobe Flash
    - Format Used By Web Developers
    - Easy To Program For
  - Adobe Photoshop
    - Simple Yet Powerful File Format
  - Custom Interface
    - Good For Beginning Programmers

Definitions

- Target Platform – Device Or Environment Where A Program Will Run
  - Playstation Portable
  - Nintendo DS
  - QBasic
  - Visual Basic

Overview

- Composed Of Input Plugins and Output Plugins

- Any Input Plugin Can Be Used To Design The Software

- Any Output Plugin Can Be Used To Generate An Executable Program On The Selected Target
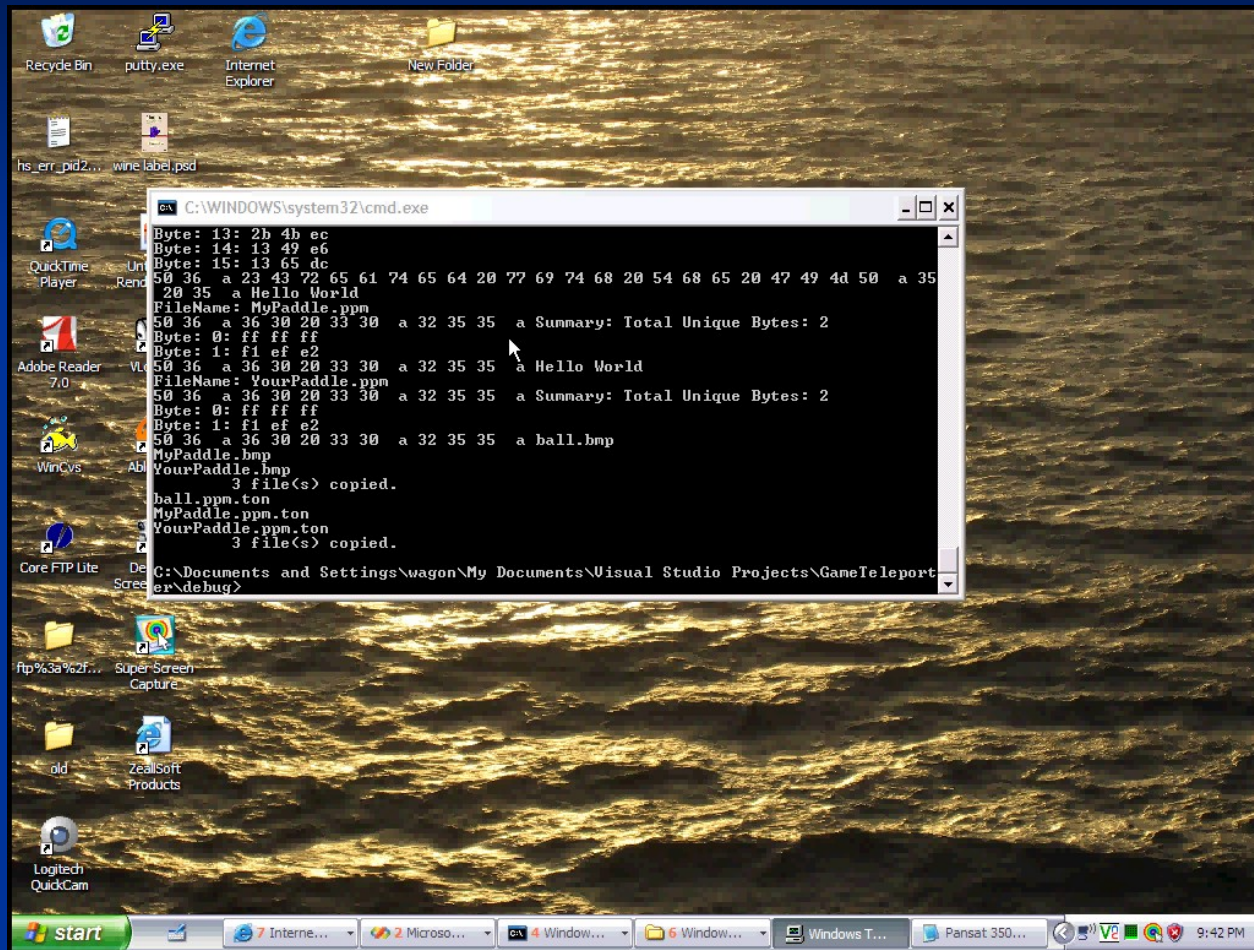
Study

- A Study Was Conducted With 18 Individuals
- Ages 13-50
- Skills –
  - No Computer Experience (Outside Of Simple Applications – Internet, Email, Word, etc)
  - Computer Gamer
  - Professional Computer Programmer
- Goal – Create A Simple Game That Demonstrates User Input And Displaying Images On Multiple Platforms Without Any Programming By The User

Study

- Participants In The Study Created A Game Similar To Pong
- No Code Was Written
- Used A Custom Program To Step Through The Process
- Game Teleporter Generated And Built All Code
  - Playstation Portable
  - Visual Basic.Net (PC Game)
- Questions Were Asked

Study - Video

Study – Video

Study - Questions

- (1) Did You Think It Would Be That Easy To Create A Game?

- (2) Was The Game Interesting?

- (3) Which Game Was Better, PSP Or Visual Basic?

- (4) Did Using This Application Make You Want To Be A Computer Programmer?

- (5) Do You Have Any Questions?

Study - Predictions

- This Software Was So Great Everyone Who Used It Would Want To Write Software For A Living.

Study Results

- (1) Did You Think It Would Be That Easy To Create A Game?
  - Non Programmers Did Not Think It Would Be That Easy To Create A Game
  - Programmers Were More Impressed That A Game Was Created That Easily For The Playstation Portable As Opposed To The PC Version.

Study - Results

- (2) Was The Game Interesting?
  - Most Common Answer – It Would Be Better If It Kept Score
  - Younger Gamers Wanted To Immediately Know How To 'Beat The Game' – There Was No Way To Beat it
  - Experienced Programmers Overlooked The Simplistic Game And Saw The Potential Of The Tool

Study - Results

- (3) Which Game Was Better, PSP Or Visual Basic?
  - Older Participants (College Age And Older) Were More Interested In The Visual Basic PC Version
    - Final Game Could Be Run On Their Own PC
  - Younger Group Was More Interested In The PSP Version Because Of The 'Cool Factor'
    - None Of The Kids In The Study Owned A PSP, However They All Knew The Cool Kid That Had One
    - Making A Game Run On A PSP Could Turn A Normal Kid Into A Cool Kid

Study - Results

- (4) Did Using This Application Make You Want To Be A Computer Programmer?
  - Only Asked To Non Programmers
  - The Answer, Unfortunately, Was No In All Cases

Study - Results

- (5) Do You Have Any Questions?
  - Longest Part Of The Study
  - Engineers Wanted To Know In Detail How Everything Worked
  - Perspective Engineers Wanted To Know How To Write Programs
  - Non Engineers Made Suggestions To Make It Better

Study - Conclusion

- The Game Teleporter Did Not Make Everyone Want To Drop Everything And Write Software

- It Did Make Everyone Ask Questions And Begin To Think About What Role Each Person Could Play In A Development Team

- Overall It Was A Complete Success

Similar Projects

- Code Converter
  - Do Not Work Very Well
  - Most Convert Between Similar Languages
- The Game Maker's Apprentice
  - Forced To Use Supplied Interface
  - Does Not Support Multiple Targets
- Game Editor
  - Forced To Use Supplied Interface
  - Supports Multiple Targets, But Only The Targets The Creator Of The Software Wants To Support
- Run Time Interpreter (JAVA,Flash)
  - Requires Distributor Of JAVA or Flash To Write A Runtime Interpreter For Each Target Platform
  - Author Of The Interpreter May Not Be An Expert
  - Run Time Interpretation Is Slow

Game Teleporter Benefits

- Open Source Allows Experts To Contribute
- If A New Plugin Is Required The User Has The Option To Become An Expert In The Field, Or Find An Expert To Write The Plugin
- Not Dependant On The Distributor Of The Software To Write Plugins
- No Run Time Interpretation, All Code Is Built For A Specific Target

Software Design

- Input Plugins Convert To Intermediate Format

- Output Plugins Read Intermediate Format And Convert To Specific Target.

- Psd Plugin Takes Images From Layers And Generates Intermediate Code To Play A Slide Show

- Playstation Portable Output Plugin Takes Intermediate Code And Generates And Builds Native PSP Code To Run A Slide Show Based On The Psd File On The Playstation Portable Itself

Input Plugins

- Adobe Flash

- Adobe Photoshop

- Custom Game Creation Plugin

Flash Input Plugin

- Written In C++

- Over 2000 Lines Of Code

- Implementation Of Variables And Stack

Psd Input Plugin

- Written In C++

- Over 1000 Lines Of Code

- Supports Displaying Of Images

- Uses ImageMagick
  - Open Source Command Line Graphics Package
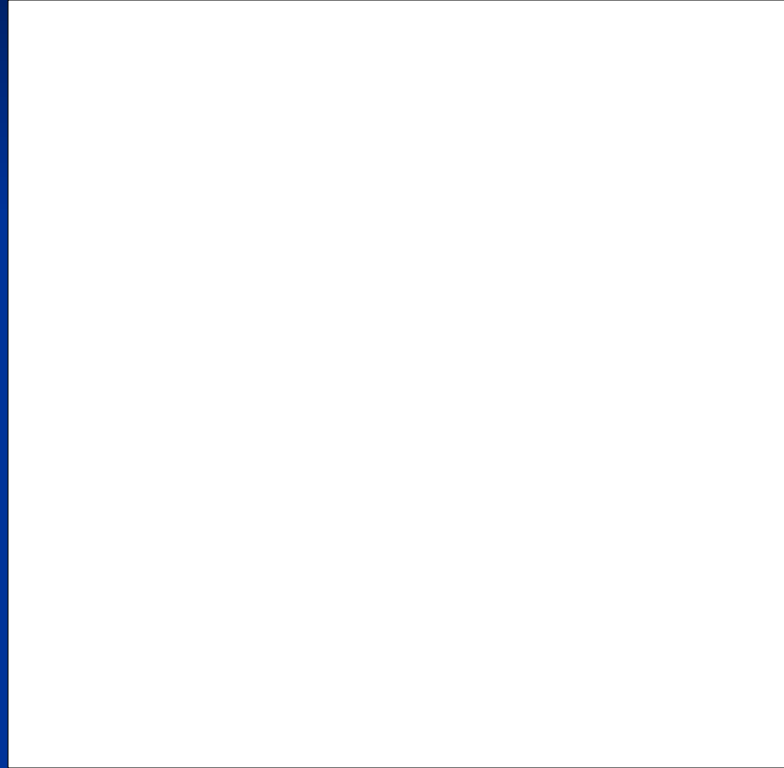 - Converts Layers To Pngs

Custom Game Creation Plugin

- Written In C#

- Over 1500 Lines Of Code

- Generates Intermediate Code For A Pong-Like Game

Intermediate File Format

- Images Stored As PNGs
- Source Code Is "c-like"
- Supports Images, Include Files, User Defined Functions

Intermediate File Format - Sample

Output Plugins

- Starts With Skeleton Set Of Files
- Skeleton Set – All Required Files To Build An App
- Inside Of Skeleton Set Are Tags
    - INCLUDES, DECLARATIONS, MAINLOOP, FUNCTIONS
- Output Plugin Generates Code For The Different Sets Of Tags Based On Intermediate Files.
- Generated Code Is Inserted Into The Proper Place In The Proper Files
- All Output Plugins Must Implement Required Functions

Visual Basic.Net Output Plugin

- Written In C++

- Over 1100 Lines Of Code

- Skeleton Set Of Files Includes Solution
  - Dim count As Int16 = 0
  - While 1
  - Application.DoEvents()
  - '<MAINLOOP>
  - '</MAINLOOP>
  - End If
  - End While

Visual Basic.Net Output Plugin

- After Code Generation Plugin Invokes Command Line Builder
  - Devenv /build debug template.sln Will Build Template.Sln

PSP Output Plugin

- Written In C++

- Over 700 Lines Of Code

- Skeleton File Includes All Files Necessary To Build A PSP Game

- Copies Files To Build Environment Within Cygwin

- Can Run Unsigned Code Because Of The '%' Character

PSP Output Plugin

- Skeleton File
  - while (1)
  - {
  - clearScreen(0xff);
  - //<MAINLOOP>
  - //</MAINLOOP>
  - sceDisplayWaitVblankStart();
  - flipScreen();
  - if (button.Buttons & PSP_CTRL_TRIANGLE)
  - {
  - sceKernelSleepThread();
  - return 0;
  - break;
  - }
 - sceKernelDelayThread(10000);
  - }

QBasic Output Plugin

- Written In C++

- Over 1000 Lines Of Code

- DOS Requires Filenames Of Only 8 Characters

- Variables And Functions Have Special Characters At The End Of Names As Designations Of Variable Type
  - Had To Keep Track Of Variable Types So They Were Printed Correctly In Basic Output File

QBasic Output Plugin

- Skeleton File
  - DO WHILE k$ <> ""

  - IF k$ = CHR$(27) THEN END
  - IF k$ = "W" THEN upPressed% = 1
  - IF k$ = "S" THEN downPressed% = 1
  - IF k$ = "A" THEN leftPressed% = 1
  - IF k$ = "D" THEN rightPressed% = 1
  - k$ = INKEY$
  - LOOP
  - END DEF
  - DO
  - updateNeeded% = 0
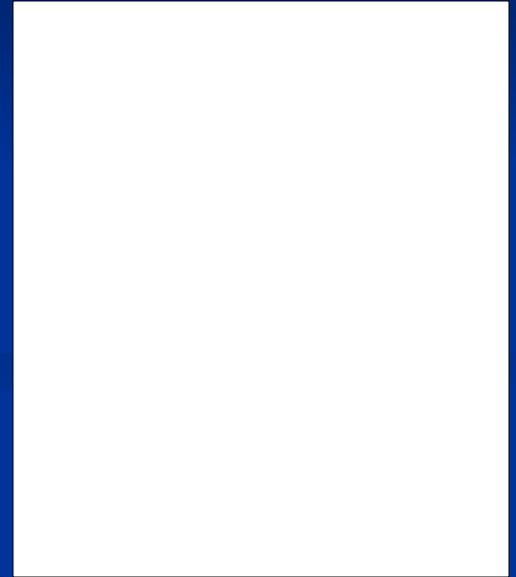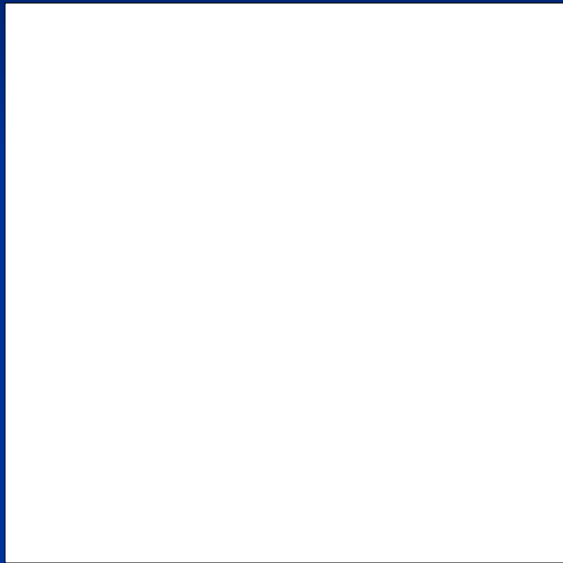 - REM <MAINLOOP>
  - REM </MAINLOOP>
  - LOOP
  - REM </FILE>

Create Bounce Game Source Code

- Intermediate Code   PSP Code   VB.Net Code
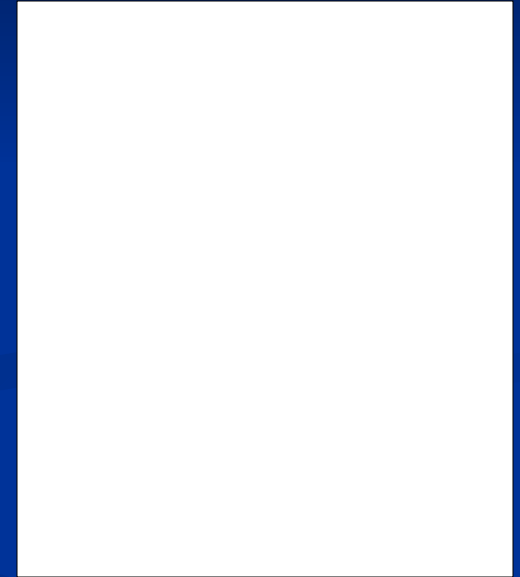
Create Bounce Game Source Code

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Summary Continued

- Demonstrated Both The Design And Implementation Of An Entire Project

- Appropriate Languages Were Used (C# For User Interface, C++ For The Game Teleporter Itself)

- Create A Study And Analyze The Results

Future Work

- This Project Is Open Source
- Source Is Available Now At
  - http://www.tonymorelli.com
- Will Be On Sourceforge
- Plugins Will Be Created By The Experts In Each Area
- Paper Will Be Presented At FIE 2007

Questions/Comments