

Contents

| | | |
|----------|---|-------------|
| | Foreword | <i>xiii</i> |
| | Preface | <i>xv</i> |
| | Acknowledgments | <i>xvii</i> |
| 1 | Introduction | <i>1</i> |
| 1.1 | A Brief Story of Laboratory Automation | <i>1</i> |
| 1.2 | Approaches for Instrument Integration | <i>2</i> |
| 1.2.1 | The Usual Approach for Instrument Integration | <i>2</i> |
| 1.2.2 | Instrument Integration with Scripting | <i>3</i> |
| 1.3 | Scripting versus Standardization in Laboratory Automation | <i>3</i> |
| 1.4 | Topics Covered in this Book | <i>5</i> |
| 1.5 | Learning by Doing: FACACO and FAKAS | <i>7</i> |
| 1.6 | Summary | <i>10</i> |
| | Suggested Reading | <i>10</i> |
| 2 | The Very Basics of AutoIt | <i>13</i> |
| 2.1 | What Is AutoIt? | <i>13</i> |
| 2.2 | Alternatives to AutoIt | <i>14</i> |
| 2.3 | Getting AutoIt | <i>15</i> |
| 2.4 | Writing Your First Script (Mouse Click Automation) | <i>15</i> |
| 2.5 | Knowing More about SciTE | <i>16</i> |
| 2.5.1 | Writing Aids | <i>17</i> |
| 2.5.2 | The Console | <i>18</i> |
| 2.6 | AutoIt on Linux | <i>18</i> |
| 2.7 | Summary | <i>18</i> |
| | Suggested Reading | <i>19</i> |
| 3 | Timed Scripts | <i>21</i> |
| 3.1 | Controlling the Timing of Actions | <i>21</i> |
| 3.2 | Moving and Activating Windows | <i>22</i> |
| 3.3 | Sending Keyboard Inputs | <i>23</i> |
| 3.4 | “For” Loops and Variables | <i>23</i> |
| 3.4.1 | Automating FAKAS | <i>25</i> |
| 3.4.2 | First view of AutoIt v3 Windows Info (AWI) | <i>26</i> |
| 3.4.3 | AU3Recorder | <i>28</i> |

- 3.4.4 Automating FACACO 29
- 3.5 Organizing Your Code: Functions and Libraries 29
- 3.5.1 Calling Functions from Different Files 31
- 3.6 Replacing Mouse Clicks with Keyboard Shortcuts 32
- 3.7 Summary 34

- 4 Interactive Scripting 35**
- 4.1 Window Monitoring 35
- 4.2 Pixel Monitoring 37
- 4.3 “While ... WEnd” Loops for Pixel Monitoring 39
- 4.4 Synchronizing FACACO and KAKAS Using Pixel Monitoring 40
- 4.5 Enhanced Pixel Monitoring Using PixelChecksum 43
- 4.6 Blocking Access to Keyboard and Mouse 46
- 4.7 Summary 46

- 5 Scripting with Controls 49**
- 5.1 Using AWI to Get Control Information 49
- 5.2 Functions That Provide Control Information 51
- 5.3 Sending Commands to Controls 52
- 5.4 Synchronizing FACACO and FAKAS Using Controls 52
- 5.5 Dealing with Errors: If ... Then 55
- 5.6 Infinite Loops and Controls 57
- 5.7 Summary 59

- 6 E-mail and Phone Alarms 61**
- 6.1 E-mail Alarms 61
- 6.1.1 Sending E-mail Using Third-Party Software 61
- 6.1.2 Sending E-mail Using SMTP 63
- 6.2 SMS and Phone Call Alarms 65
- 6.2.1 Sending SMS 65
- 6.2.2 Making Phone Calls 66
- 6.3 Summary 69

- 7 Using Low-Cost Equipment for Laboratory Automation 71**
- 7.1 G-Code Devices 71
- 7.1.1 CNC Routers 71
- 7.1.2 G-Code for CNC 73
- 7.1.3 Synchronizing a CNC Router to a Laboratory Instrument 74
- 7.1.4 3D Printers 75
- 7.2 Robotic Arms 76
- 7.3 Do-It-Yourself Devices 77
- 7.4 Summary 77
- Suggested Reading 78

- 8 Arrays and Strings 79**
- 8.1 Organized Data: Arrays 79
- 8.2 Raw Data: Strings 80
- 8.3 Summary 82

| | | |
|-----------|---|------------|
| 9 | Data Processing with Spreadsheets | 83 |
| 9.1 | Exporting Results to Spreadsheet Software | 83 |
| 9.1.1 | Selecting Spreadsheet Software | 83 |
| 9.1.2 | Transferring Data to Spreadsheets | 84 |
| 9.1.3 | Transferring Data in Real Time | 87 |
| 9.2 | Dealing with Saved Results (Files) | 87 |
| 9.3 | Processing Spreadsheet Files | 91 |
| 9.4 | Summary | 94 |
| | | |
| 10 | Working with Databases | 95 |
| 10.1 | Starting SQLite in AutoIt | 95 |
| 10.2 | Creating SQLite Databases | 96 |
| 10.3 | Modifying an Existing SQLite Database | 99 |
| 10.4 | Databases with More Than One Table | 101 |
| 10.5 | Retrieving Data from Databases | 102 |
| 10.6 | Summary | 104 |
| | | |
| 11 | Simple Remote Synchronization | 107 |
| 11.1 | Time Macros | 107 |
| 11.2 | Synchronizing FACACO and FAKAS Using Time Macros | 108 |
| 11.3 | Summary | 109 |
| | | |
| 12 | Remote Synchronization Using Remote Control Software | 111 |
| 12.1 | TeamViewer | 111 |
| 12.2 | Synchronizing FACACO and FAKAS Using TeamViewer | 112 |
| 12.3 | Summary | 115 |
| | | |
| 13 | Text-Based Remote Synchronization | 117 |
| 13.1 | Choosing Instant Messaging Software | 117 |
| 13.2 | Writing and Reading from Trillian Using AutoIt | 119 |
| 13.3 | Synchronizing FACACO and FAKAS Using Trillian | 121 |
| 13.4 | Summary | 123 |
| | | |
| 14 | Remote Synchronization Using IRC | 125 |
| 14.1 | AutoIt and IRC | 125 |
| 14.2 | Monitoring the Connection | 126 |
| 14.3 | Synchronizing FACACO and FAKAS | 130 |
| 14.4 | Final Considerations | 132 |
| 14.5 | Summary | 133 |
| | | |
| 15 | Remote Synchronization Using Windows LAN Tools | 135 |
| 15.1 | Connecting to a LAN | 135 |
| 15.2 | Creating a Shared Folder | 137 |
| 15.3 | Synchronizing FACACO and FAKAS | 139 |
| 15.4 | Summary | 140 |

- 16 Remote Synchronization Using Third-Party LAN Software 143**
 - 16.1 Connecting to a LAN Using Bingo's Chat 143
 - 16.2 Automated Communication Using Bingo's Chat 144
 - 16.3 Synchronizing FACACO and FAKAS 147
 - 16.4 Summary 148

- 17 Interacting with Devices via COM Ports 149**
 - 17.1 Serial Communication Protocols 149
 - 17.2 AutoIt and COM Ports 150
 - 17.3 Monitoring in Real Time 153
 - 17.4 Implications for Other Devices 157
 - 17.5 Other Technologies for Instrument Control 157
 - 17.6 Summary 157
 - Suggested Reading 158

- 18 Introduction to Graphical User Interface (GUI) 159**
 - 18.1 Making a Very Simple GUI 159
 - 18.2 Adding Simple Elements to a GUI 161
 - 18.3 Setting Keyboard Shortcuts 163
 - 18.4 Summary 165

- 19 Using GUI to Control Instruments 167**
 - 19.1 GUIs to Control the EHMA Valve Actuator 167
 - 19.2 Controlling Two or More COM Ports in the Same Script 169
 - 19.3 A GUI to Control a Digital Balance 171
 - 19.4 Summary 174

- 20 Multitasking GUIs 177**
 - 20.1 The "GUIOnEventMode" Option 177
 - 20.2 Multitasking Using GUIOnEventMode 179
 - 20.3 Summary 182

- 21 Adding Graphical Elements to a GUI 183**
 - 21.1 Getting Started with GDIplus 183
 - 21.2 Creating Animations Using GDIplus 185
 - 21.3 Summary 189

- 22 Creating GUIs Using Koda 191**
 - 22.1 Getting Started with Koda 191
 - 22.2 Creating a Script 194
 - 22.3 Summary 196

- 23 Some Suggestions 197**
 - 23.1 For Manufacturers: All Instruments with a GUI 197
 - 23.2 For Manufacturers: All GUIs with Access to Controls 197
 - 23.3 For Manufacturers: Stop Developing Standards for Laboratory Automation 197

| | | |
|----------|---|------------|
| 23.4 | For Users: Hardware Trumps Software | 198 |
| 23.5 | For Users: If You Can, Choose Controls | 198 |
| 23.6 | For Users: AutoIt May Not be the Best Programming Option in Some Cases | 198 |
| 23.7 | For Users: Be Aware of Technological Advances | 199 |
| 23.8 | For Users and Manufacturers: AutoIt Scripts May Serve as Basis for New Products | 199 |
| | Suggested Reading | 199 |
| A | Other SciTE Features | 201 |
| A.1 | Code Wizard | 201 |
| A.2 | Organizing Your Scripts with Tidy | 202 |
| A.3 | Tools that Facilitate Navigation | 203 |
| B | Optical Character Recognition | 207 |
| B.1 | OCR in AutoIt | 207 |
| B.2 | Copying from the Screen and Applying OCR | 209 |
| C | Scripting with Nonstandard Controls (UIA) | 211 |
| C.1 | Downloading the UIA Software Package | 211 |
| C.2 | Sending Instructions | 212 |
| C.2.1 | Mouse Clicks | 213 |
| C.2.2 | Keyboard Inputs | 216 |
| C.3 | Getting Information about Controls | 217 |
| C.3.1 | Getting Information from FAKAS Controls | 218 |
| C.3.2 | Getting Information from Controls of Other Programs | 220 |
| C.4 | Automating a LabView Program | 221 |
| C.5 | Summary | 222 |
| | Index | 223 |

