

# CONTENTS IN DETAIL

ACKNOWLEDGMENTS .....	XV
<b>INTRODUCTION .....</b>	<b>XVII</b>
WHAT IS THIS BOOK ALL ABOUT?.....	XVIII
WHAT'S IN THE BOOK.....	XVIII
WHAT YOU'LL NEED FOR THIS BOOK.....	XXI
<b>CHAPTER 1: GETTING STARTED WITH THE RASPBERRY PI .....</b> 1	
WHAT IS A RASPBERRY PI?.....	2
THE RASPBERRY PI'S HARDWARE .....	2
THE RASPBERRY PI 4 .....	3
OTHER MODELS .....	3
GPIO PINS .....	5
SETTING UP YOUR RASPBERRY PI.....	6
DOWNLOADING THE OPERATING SYSTEM .....	7
INSTALLING THE OPERATING SYSTEM .....	8
SETTING UP YOUR PI EQUIPMENT.....	9
BOOTING UP YOUR PI .....	9
CONFIGURING YOUR RASPBERRY PI .....	10
A QUICK TOUR OF THE RASPBIAN OPERATING SYSTEM .....	12
CONFIGURING YOUR RASPBERRY PI .....	14
GOING ONLINE.....	18
USING THE COMMAND LINE.....	20
SETTING THE TIME .....	22
ACCESSING THE CONFIGURATION SETTINGS .....	23
UPDATING AND UPGRADEING .....	23
INSTALLING SOFTWARE PACKAGES.....	24
ACCESSING YOUR RASPBERRY PI REMOTELY .....	24
ACCESSING THE RASPBERRY PI VIA SSH.....	25
ACCESSING THE RASPBERRY PI VIA VNC USING REALVNC .....	27
ACCESSING THE RASPBERRY PI VIA REMOTE DESKTOP.....	30
TRANSFERRING FILES .....	31
WRAPPING UP .....	33

<b>CHAPTER 2: PYTHON PROGRAMMING .....</b>	<b>35</b>
EXPLORING PYTHON.....	36
INTRODUCING THONNY AND IDLE .....	36
WRITING YOUR FIRST PROGRAM.....	38
STRINGS.....	39
VARIABLES .....	39
LOOPS.....	40
WHILE LOOPS .....	41
FOR LOOPS .....	42
CONDITIONALS .....	42
FUNCTIONS.....	43
RUNNING PYTHON CODE FROM THE TERMINAL.....	44
COMMON PROGRAMMING MISTAKES.....	44
CAPITAL LETTERS .....	45
INDENTATION.....	45
USING COMMENTS.....	47
WRAPPING UP.....	47
 <b>CHAPTER 3: HOT GLUE NIGHT-LIGHT .....</b>	 <b>49</b>
WHAT YOU'LL NEED .....	50
BUILDING THE CUSTOM NIGHT-LIGHT.....	51
CODING THE NIGHT-LIGHT.....	53
RUNNING YOUR PROGRAM .....	55
MODIFY: FADING THE LED .....	55
BUILDING THE LED NIGHT-LIGHT .....	55
WIRING YOUR NIGHT-LIGHT .....	56
CODING THE NIGHT-LIGHT.....	57
RUNNING YOUR PROGRAM .....	58
WRAPPING UP.....	59
 <b>CHAPTER 4: THE PI CAMERA: SELFIE SNAPPER.....</b>	 <b>61</b>
WHAT YOU'LL NEED .....	62
VERSIONS AND SPECIFICATIONS .....	62
PHOTOGRAPHY WITH THE PI CAMERA .....	63
SETTING UP THE HARDWARE AND SOFTWARE .....	63
CUSTOMIZING YOUR IMAGES.....	68
TRIGGERING THE CAMERA WITH A BUTTON.....	73
VIDEOS WITH THE PI CAMERA .....	76
MAKING A VIDEO .....	76
PLAYING THE VIDEO .....	77

PLAYING THE VIDEO ON A COMPUTER OR OTHER DEVICE.....	77
CREATING A TIME-LAPSE VIDEO .....	78
WRAPPING UP.....	82
<b>CHAPTER 5: PI SPY PART 1: HACKING WEBCAMS FOR SECRET SURVEILLANCE.....</b>	<b>83</b>
WHAT YOU'LL NEED .....	84
SETTING UP YOUR WEBCAM .....	84
STREAMING A VIDEO FROM THE WEBCAM .....	87
LIVE STREAMING TO A DEVICE.....	90
STOPPING AND RESTARTING MOTION.....	94
WRAPPING UP.....	95
<b>CHAPTER 6: MANIPULATING MINECRAFT.....</b>	<b>97</b>
WHAT YOU'LL NEED .....	98
MINECRAFT ON THE RASPBERRY PI.....	98
STARTING MINECRAFT.....	98
FINDING YOURSELF: USING THE X-, Y-, AND Z- COORDINATES .....	100
HACKING MINECRAFT .....	101
POSTING A MESSAGE TO CHAT .....	101
CODING THE CHAT MESSENGER.....	102
RUNNING YOUR PROGRAM .....	102
TRAMPOLINE GRASS.....	102
CODING THE TRAMPOLINE GRASS .....	103
RUNNING YOUR PROGRAM .....	104
TAKING IT FURTHER .....	104
THE SAND DROP GAME .....	104
CODING THE SAND DROP GAME .....	105
RUNNING YOUR PROGRAM .....	106
TAKING IT FURTHER .....	106
MINECRAFT-CONTROLLED LED .....	107
WIRING THE MINECRAFT LED .....	107
CODING THE MINECRAFT LED .....	108
RUNNING YOUR PROGRAM .....	108
CAMERA SURVEILLANCE MINECRAFT TOWERS .....	109
BUILDING THE THREE TRIGGER TOWERS .....	110
CODING THE CAMERA TOWERS.....	111
RUNNING YOUR PROGRAM .....	114
WRAPPING UP.....	114

<b>CHAPTER 7: RADIO INVASION .....</b>	<b>115</b>
WHAT YOU'LL NEED .....	116
PREPARING THE RASPBERRY PI.....	116
RUNNING A TEST PROGRAM .....	118
STREAMING AN MP3 MUSIC FILE .....	119
RECORDING AND BROADCASTING YOUR OWN FILE.....	120
SETTING UP YOUR MICROPHONE AND SPEAKERS .....	120
MAKING AND PLAYING YOUR RECORDING ON THE RASPBERRY PI.....	121
BROADCASTING THE FILE.....	122
CODING THE SOUNDBOARD .....	123
CREATING THE GUI FUNCTIONS.....	123
CREATING THE WINDOW AND BUTTONS .....	125
RUNNING YOUR PROGRAM.....	127
WRAPPING UP.....	128
 <b>CHAPTER 8: THE AUTOMATIC TEXTING MACHINE .....</b>	<b>129</b>
WHAT YOU'LL NEED .....	130
A LITTLE ABOUT SMS .....	130
CREATING A SIMPLE TEXT SENDER .....	130
SIGNING UP FOR A TWILIO ACCOUNT .....	130
SETTING UP A TWILIO PHONE NUMBER .....	133
CREATING A PROJECT.....	133
INSTALLING TWILIO .....	134
WRITING THE CODE .....	134
CREATING THE AUTOMATIC SMS REMINDER MACHINE .....	136
SETTING UP AND VALIDATING THE FORMAT .....	137
CODING THE REMINDER MESSAGE .....	138
MATCHING TIMES AND SENDING THE MESSAGE .....	139
WRAPPING UP.....	140
 <b>CHAPTER 9: PI SPY PART 2: WI-FI AND BLUETOOTH TRACKING .....</b>	<b>141</b>
WHAT YOU'LL NEED .....	142
CREATING YOUR STATUS BOARD .....	143
WIRING UP THE LEDS.....	143
ADDING THE LEDS TO THE BOARD .....	143
CONNECTING THE LEDS TO THE RASPBERRY PI.....	144
ATTACHING THE RASPBERRY PI .....	146
TRACKING DEVICES WITH IP ADDRESSES .....	146

<b>FINDING YOUR IP ADDRESS .....</b>	<b>147</b>
<b>FINDING THE IP ADDRESSES OF OTHER DEVICES.....</b>	<b>147</b>
<b>    USING FING.....</b>	<b>148</b>
<b>    USING NMAP .....</b>	<b>148</b>
<b>WRITING THE STATUS BOARD CODE .....</b>	<b>150</b>
<b>    SETTING UP AND IDENTIFYING THE FIRST DEVICE .....</b>	<b>150</b>
<b>    FINDING THE REST OF THE DEVICES .....</b>	<b>152</b>
<b>        ADDING DELAYS, RESPONDING TO DATA,                 AND ADDING THE BUTTON.....</b>	<b>152</b>
<b>    RUNNING THE PROGRAM.....</b>	<b>154</b>
<b>    TROUBLESHOOTING.....</b>	<b>154</b>
<b>SETTING UP THE CODE TO RUN AUTOMATICALLY .....</b>	<b>154</b>
<b>    USING CRON TO AUTOSTART THE PROGRAM .....</b>	<b>155</b>
<b>    REBOOTING TO THE COMMAND LINE .....</b>	<b>156</b>
<b>TRACKING DEVICES WITH BLUETOOTH .....</b>	<b>157</b>
<b>    WHAT IS BLUETOOTH? .....</b>	<b>158</b>
<b>    TURNING ON THE RASPBERRY PI BLUETOOTH .....</b>	<b>158</b>
<b>    WRITING THE STATUS BOARD CODE .....</b>	<b>160</b>
<b>        SHUTTING DOWN.....</b>	<b>162</b>
<b>WRAPPING UP.....</b>	<b>163</b>
 <b>CHAPTER 10: MAGIC MUSIC BOX .....</b>	<b>165</b>
<b>WHAT YOU'LL NEED .....</b>	<b>166</b>
<b>CHOOSING A SPEAKER TYPE .....</b>	<b>166</b>
<b>BUILDING THE MAGIC MUSIC BOX .....</b>	<b>168</b>
<b>    WIRING THE BUTTONS.....</b>	<b>168</b>
<b>    CONNECTING THE SPEAKER .....</b>	<b>171</b>
<b>    CODING THE MAGIC MUSIC BOX.....</b>	<b>172</b>
<b>        RUNNING YOUR PROGRAM .....</b>	<b>179</b>
<b>AUTOMATICALLY STARTING THE MP3 PLAYER ON BOOT-UP .....</b>	<b>180</b>
<b>    HEADPHONE JACK OPTION.....</b>	<b>180</b>
<b>    BLUETOOTH OPTION .....</b>	<b>182</b>
<b>PUTTING IT ALL TOGETHER .....</b>	<b>183</b>
<b>WRAPPING UP.....</b>	<b>184</b>
 <b>CHAPTER 11: NATURE BOX: MOTION-SENSING CAMERA .....</b>	<b>185</b>
<b>WHAT YOU'LL NEED .....</b>	<b>186</b>
<b>SETTING UP THE PASSIVE INFRARED SENSOR.....</b>	<b>186</b>
<b>    WIRING THE PIR.....</b>	<b>187</b>
<b>    TESTING THE PIR.....</b>	<b>187</b>

SETTING UP THE PI CAMERA .....	189
ATTACHING THE PI CAMERA.....	189
CREATING A NEW FOLDER TO STORE THE IMAGES .....	190
WRITING THE TEST CODE .....	190
RETRIEVING THE IMAGES FROM THE RASPBERRY PI .....	192
SETTING UP A DROPBOX ACCOUNT .....	192
INSTALLING DROPBOX FOR PYTHON.....	194
CODING THE FINAL NATURE BOX.....	195
SETTING UP THE FINAL PROGRAM .....	196
COMBINING THE CAMERA AND SENSOR .....	196
CREATING THE TRY AND EXCEPT .....	197
RUNNING THE MOTION SENSOR.....	198
STARTING THE PROGRAM AUTOMATICALLY .....	199
PUTTING IT ALL TOGETHER .....	201
WRAPPING UP.....	202
 <b>CHAPTER 12: SMART PLUGS FOR SMART HOME HACKS .....</b>	 <b>203</b>
WHAT YOU'LL NEED .....	204
SETTING UP THE ENERGENIE REMOTE PLUG.....	205
TESTING THE LAMP .....	206
CONTROLLING THE LAMP REMOTELY .....	206
FLASHING THE LAMP ON AND OFF .....	207
USING AN APP TO CONTROL THE PLUG .....	208
CODING THE SMART PLUG .....	211
RUNNING THE PROGRAM.....	211
IMPROVING THE CODE TO SWITCH ON AND OFF.....	212
WRAPPING UP.....	214
 <b>CHAPTER 13: MIRROR, MIRROR: THE SOCIAL MEDIA STATUS MIRROR .....</b>	 <b>215</b>
WHAT YOU'LL NEED .....	216
PREPARING THE EQUIPMENT .....	217
CONNECTING THE SPEAKER .....	217
TEACHING THE PI TO READ TEXT OUT LOUD.....	218
PREPARING THE LEDS .....	218
USING THE NPN TRANSISTOR.....	219
PREPARING THE CIRCUIT .....	220
TESTING THE LEDS .....	221
SETTING UP YOUR TWITTER DEVELOPER ACCOUNT.....	221

SETTING UP YOUR TWITTER APP .....	227
CREATING THE ACCESS KEYS AND TOKENS.....	229
PROGRAMMING YOUR RASPBERRY PI WITH THE APP .....	230
SENDING YOUR FIRST TWEET.....	230
READING TWEETS.....	232
STREAMING TWEETS AUTOMATICALLY .....	233
THE FINAL PROGRAM .....	236
STARTING THE FINAL PROGRAM .....	236
ADDING THE MAIN PROGRAM CODE .....	237
AUTOMATICALLY STARTING THE TWITTER STREAM .....	239
PUTTING IT ALL TOGETHER .....	240
WRAPPING UP.....	241
 <b>CHAPTER 14: COMPUTER GAMES WITH THE SENSE HAT.....</b>	<b>243</b>
WHAT YOU'LL NEED .....	245
WHAT IS THE SENSE HAT?.....	245
GETTING STARTED WITH THE SENSE HAT.....	246
SCROLLING TEXT ACROSS THE SENSE HAT .....	246
TAKING A TEMPERATURE READING.....	247
MAKING A REAL-TIME TEMPERATURE DISPLAY .....	248
BUILDING A COMPASS .....	249
MAKING A MAGICAL SPARKLE SCREEN .....	250
CREATING AN IMAGE WITH THE LED DISPLAY .....	251
CREATING IMAGES WITH THE GRID DRAW PROGRAM.....	253
BUILDING THE ROCK, PAPER, SCISSORS, LIZARD, SPOCK GAME.....	256
IMPORTING MODULES AND CREATING THE VARIABLES.....	257
PREPARING THE GAME .....	258
SETTING UP THE PLAYER'S CHOICE .....	258
SELECTING AN OBJECT .....	259
NOTIFYING THE PLAYER OF THEIR OPTION CHOICE .....	260
CODING THE RASPBERRY PI'S SELECTION .....	261
DISPLAYING THE RASPBERRY PI'S CHOICE.....	262
CHOOSING A WINNER.....	262
STARTING A NEW GAME.....	264
PLAY AGAIN? .....	264
WRAPPING UP.....	266