

Dr. Richard Grimmer

Foreword by:
Jason Kridner

Co-founder of BeagleBoard.org

BeagleBone Robotic Projects

Second Edition

Create complex and exciting robotic projects with the
BeagleBone Blue



Packt

Beaglebone Robotic Projects Grimmert Richard

Rodolfo Giometti



Beaglebone Robotic Projects Grimmatt Richard:

BeagleBone Robotic Projects Richard Grimmatt, 2017-06-13 Exciting new capabilities to enable even easier DIY robotics with BeagleBone Blue Key Features Build powerful robots with the all new BeagleBone Blue Communicate with your robot and teach it to detect and respond to its environment Control walking rolling swimming and flying robots with your iOS and Android mobile devices Book Description BeagleBone Blue is effectively a small light cheap computer in a similar vein to Raspberry Pi and Arduino It has all of the extensibility of today's desktop machines but without the bulk expense or noise This project guide provides step by step instructions that enable anyone to use this new low cost platform in some fascinating robotics projects By the time you are finished your projects will be able to see speak listen detect their surroundings and move in a variety of amazing ways The book begins with unpacking and powering up the components This includes guidance on what to purchase and how to connect it all successfully and a primer on programming the BeagleBone Blue You will add additional software functionality available from the open source community including making the system see using a webcam hear using a microphone and speak using a speaker You will then learn to use the new hardware capability of the BeagleBone Blue to make your robots move as well as discover how to add sonar sensors to avoid or find objects Later you will learn to remotely control your robot through iOS and Android devices At the end of this book you will see how to integrate all of these functionalities to work together before developing the most impressive robotics projects Drone and Submarine What you will learn Power on and configure the BeagleBone Blue Get to know Simple programming techniques to enable the unique hardware capabilities of the BeagleBone Blue Connect standard hardware to enable your projects to see speak hear and move Build advanced capabilities into your projects such as GPS and sonar sensors Build complex projects that can fly or go under or on the water Who this book is for This book is for anyone who is curious about using new low cost hardware to create robotic projects and have previously been the domain of research labs major universities or defence departments Some programming experience would be useful but if you know how to use a personal computer you can use this book to construct far more complex systems than you would have thought possible BeagleBone Robotic Projects Richard Grimmatt, 2013-12-26 Develop practical example projects with detailed explanations combine the projects in a vast number of ways to create different robot designs or work through them in sequence to discover the full capability of the BeagleBone Black This book is for anyone who is curious about using new low cost hardware to create robotic projects that have previously been the domain of research labs major universities or Defence departments Some programming experience would be useful but if you know how to use a personal computer you can use this book to construct far more complex systems than you would have thought possible *Mastering BeagleBone Robotics* Richard Grimmatt, 2014-12-22 If you want a simple guide to building complex robots then this book is for you You'll need some programming knowledge and experience working with mechanical systems BeagleBone Robotic Projects - Second Edition Richard Grimmatt, 2017-06-13 Exciting new

capabilities to enable even easier DIY robotics with BeagleBone Blue

About This Book Build powerful robots with the all new BeagleBone Blue Communicate with your robot and teach it to detect and respond to its environment Control walking rolling swimming and flying robots with your iOS and Android mobile devices

Who This Book Is For This book is for anyone who is curious about using new low cost hardware to create robotic projects and have previously been the domain of research labs major universities or defence departments Some programming experience would be useful but if you know how to use a personal computer you can use this book to construct far more complex systems than you would have thought possible

What You Will Learn Power on and configure the BeagleBone Blue Get to know Simple programming techniques to enable the unique hardware capabilities of the BeagleBone Blue Connect standard hardware to enable your projects to see speak hear and move Build advanced capabilities into your projects such as GPS and sonar sensors Build complex projects that can fly or go under or on the water

In Detail BeagleBone Blue is effectively a small light cheap computer in a similar vein to Raspberry Pi and Arduino It has all of the extensibility of today s desktop machines but without the bulk expense or noise This project guide provides step by step instructions that enable anyone to use this new low cost platform in some fascinating robotics projects By the time you are finished your projects will be able to see speak listen detect their surroundings and move in a variety of amazing ways The book begins with unpacking and powering up the components This includes guidance on what to purchase and how to connect it all successfully and a primer on programming the BeagleBone Blue You will add additional software functionality available from the open source community including making the system see using a webcam hear using a microphone and speak using a speaker You will then learn to use the new hardware capability of the BeagleBone Blue to make your robots move as well as discover how to add sonar sensors to avoid or find objects Later you will learn to remotely control your robot through iOS and Android devices At the end of this book you will see how to integrate all of these functionalities to work together before developing the most impressive robotics projects Drone and Submarine Style and approach

Develop practical example projects with detailed explanations combine the projects in a vast number of ways to create different robot designs or work through them in sequence to discover the full capability of the BeagleBone Blue

Arduino Robotic Projects Richard Grimmer, 2014-08-14 This book is for anyone who has been curious about using Arduino to create robotic projects that were previously the domain of research labs of major universities or defense departments Some programming background is useful but if you know how to use a PC you can with the aid of the step by step instructions in this book construct complex robotic projects that can roll walk swim or fly

Arduino Robotic Projects Richard Grimmer, 2014-08-14 This book is for anyone who has been curious about using Arduino to create robotic projects that were previously the domain of research labs of major universities or defense departments Some programming background is useful but if you know how to use a PC you can with the aid of the step by step instructions in this book construct complex robotic projects that can roll walk swim or fly

Raspberry Pi Robotic Projects Richard

Grimmett,2016-10-17 Work through a mix of amazing robotic projects using the Raspberry Pi Zero or the Raspberry Pi 3 Key Features Easy to follow instructions yet the ones that help you build powerful robots and exclusive coverage of mobile robots with the Pi Zero Build robots that can run swim and fly and the cutting edge dimension of robotics that is possible with the Raspberry Pi Zero and Pi 3 Interact with your projects wirelessly and make sci fi possible right in your home Book DescriptionThis book will allow you to take full advantage of Raspberry Pi Zero and Raspberry Pi 3 by building both simple and complex robotic projects The book takes a mission critical approach to show you how to build amazing robots and helps you decide which board to use for which type of robot The book puts a special emphasis on designing mobile or movable robots using the Raspberry Pi Zero The projects will show inexpensive yet powerful ways to take full advantage It will teach you how to program Raspberry Pi control the movement of your robot and add features to your robots What you will learn Control a variety of different DC motors Add a USB webcam to see what your robot can see Attach a projector to project information Insert USB control hardware to control a complex robot with two legs Include speech recognition so that your projects can receive commands Add speech output to that the robot can communicate with the world around it Include wireless communication so that you can see what the robot is seeing and control the robot from a distance Who this book is for This book is for hobbyists and programmers who are excited about using the Raspberry Pi 3 and Raspberry Pi Zero It is for those who are taking their first steps towards using these devices to control hardware and software and write simple programs that enable amazing projects No programming experience is required Just a little computer and mechanical aptitude and the desire to build some interesting projects

BeagleBone: Creative Projects for Hobbyists Charles Hamilton,Rodolfo Giometti,Richard Grimmett,2017-07-20 Learn to build amazing robotic projects using the powerful BeagleBone Black About This Book Push your creativity to the limit through complex diverse and fascinating projects Develop applications with the BeagleBone Black and open source Linux software Sharpen your expertise in making sophisticated electronic devices Who This Book Is For This Learning Path is aimed at hobbyists who want to do creative projects that make their life easier and also push the boundaries of what can be done with the BeagleBone Black This Learning Path s projects are for the aspiring maker casual programmer and budding engineer or tinkerer You ll need some programming knowledge and experience of working with mechanical systems to get the complete experience from this Learning Path What You Will Learn Set up and run the BeagleBone Black for the first time Get to know the basics of microcomputing and Linux using the command line and easy kernel mods Develop a simple web interface with a LAMP platform Prepare complex web interfaces in JavaScript and get to know how to stream video data from a webcam Find out how to use a GPS to determine where your sailboat is and then get the bearing and distance to a new waypoint Use a wind sensor to sail your boat effectively both with and against the wind Build an underwater ROV to explore the underwater world See how to build an autonomous Quadcopter In Detail BeagleBone is a microboard PC that runs Linux It can connect to the Internet and run OSes such as Android and

Ubuntu You can transform this tiny device into a brain for an embedded application or an endless variety of electronic inventions and prototypes This Learning Path starts off by teaching you how to program the BeagleBone You will create introductory projects to get yourselves acquainted with all the nitty gritty Then we ll focus on a series of projects that are aimed at hobbyists like you and encompass the areas of home automation and robotics With each project we ll teach you how to connect several sensors and an actuator to the BeagleBone Black We ll also create robots for land sea and water Yes really The books used in this Learning Path are BeagleBone Black Cookbook BeagleBone Home Automation Blueprints Mastering BeagleBone Robotics Style and approach This practical guide transforms complex and confusing pieces of technology to become accessible with easy to succeed instructions Through clear concise examples you will quickly get to grips with the core concepts needed to develop home automation applications with the BeagleBone Black *Getting Started with Electronic Projects* Bill Pretty,2015-01-13 This book is aimed at hobbyists with basic knowledge of electronics circuits Whether you are a novice electronics project builder a ham radio enthusiast or a BeagleBone tinkerer you will love this book *Building Networks and Servers Using BeagleBone* Bill Pretty,Glenn Vander Veer,2015-05-28 If you are a developer with BeagleBone experience and want to learn how to use it to set up a network and file server then this book is ideal for you To make the most of this book you should be comfortable with the Linux operating system and know how to install software from the Internet but you do not have to be a network guru *BeagleBone Media Center* David Lewin,2015-01-31 Whether you are a hobbyist or a professional this book will get you fully equipped to resolve the most commonly occurring media related challenges If you want to expand your horizons beyond lighting an LED and push the limits of your board this is just the book for you Working knowledge of BeagleBone is assumed **Learning Robotics Using Python** Lentin Joseph,2015-05-27 If you are an engineer a researcher or a hobbyist and you are interested in robotics and want to build your own robot this book is for you Readers are assumed to be new to robotics but should have experience with Python [BeagleBone Home Automation Blueprints](#) Rodolfo Giometti,2016-02-03 Automate and control your home using the power of the BeagleBone Black with practical home automation projects About This Book Build set up and develop your circuits via step by step tutorial of practical examples from initial board setup to device driver management Get access to several kinds of computer peripherals to monitor and control your domestic environment using this guide This book is spread across 10 chapters all focused on one practical home automation project Who This Book Is For This book is for developers who know how to use BeagleBone and are just above the beginner level If you want to learn to use embedded machine learning capabilities you should have some experience of creating simple home automation projects What You Will Learn Build a CO and other gas sensor with a buzzer LED alarm to signal high concentrations Log environment data and plot it in a fancy manner Develop a simple web interface with a LAMP platform Prepare complex web interfaces in JavaScript and get to know how to stream video data from a webcam Use APIs to get access to a Google Docs account or a WhatsApp Facebook account to manage a

home automation system Add custom device drivers to manage an LED with different blinking frequencies Discover how to work with electronic components to build small circuits Use an NFS temperature sensor relays and other peripherals to monitor and control your surroundings In Detail BeagleBone is a microboard PC that runs Linux It can connect to the Internet and can run OSes such as Android and Ubuntu BeagleBone is used for a variety of different purposes and projects from simple projects such as building a thermostat to more advanced ones such as home security systems Packed with real world examples this book will provide you with examples of how to connect several sensors and an actuator to the BeagleBone Black You ll learn how to give access to them in order to realize simple to complex monitoring and controlling systems that will help you take control of the house You will also find software examples of implementing web interfaces using the classical PHP HTML pair with JavaScript using complex APIs to interact with a Google Docs account WhatsApp or Facebook This guide is an invaluable tutorial if you are planning to use a BeagleBone Black in a home automation project

Style and approach This step by step guide contains several home automation examples that can be used as base projects for tons of other home automation and control systems Through clear concise examples based on real life situations you will quickly get to grips with the core concepts needed to develop home automation applications with the BeagleBone Black using both the C language and high level scripting languages such as PHP Python and JavaScript

Bad to the Bone Steven Barrett, Jason Kridner, 2022-06-01 BeagleBone Black is a low cost open hardware computer uniquely suited to interact with sensors and actuators directly and over the Web Introduced in April 2013 by BeagleBoard.org a community of developers first established in early 2008 BeagleBone Black is used frequently to build vision enabled robots home automation systems artistic lighting systems and countless other do it yourself and professional projects BeagleBone variants include the original BeagleBone and the newer BeagleBone Black both hosting a powerful 32 bit super scalar ARM Cortex A8 processor capable of running numerous mobile and desktop capable operating systems typically variants of Linux including Debian Android and Ubuntu Yet BeagleBone is small enough to fit in a small mint tin box The Bone may be used in a wide variety of projects from middle school science fair projects to senior design projects to first prototypes of very complex systems Novice users may access the power of the Bone through the user friendly BoneScript software experienced through a Web browser in most major operating systems including Microsoft Windows Apple Mac OS X or the Linux operating systems Seasoned users may take full advantage of the Bone s power using the underlying Linux based operating system a host of feature extension boards Capes and a wide variety of Linux community open source libraries This book provides an introduction to this powerful computer and has been designed for a wide variety of users including the first time novice through the seasoned embedded system design professional The book contains background theory on system operation coupled with many well documented illustrative examples Examples for novice users are centered on motivational fun robot projects while advanced projects follow the theme of assistive technology and image processing applications

Raspberry Pi Robotics Essentials

Richard Grimmett,2015-06-19 The Raspberry Pi B2 is an inexpensive embedded processor that provides a high performance Linux development environment This book is a fast paced guide that will show you how to use Raspberry Pi technology to build a biped robot that can interact with its environment We start off by explaining the basics of getting your Raspberry Pi up and running ready to be mounted on your biped platform After this you will be introduced to the art of constructing a mechanism for the biped platform You will then learn to develop a vision system for your robot as well as a means by which you can control and monitor it At the end of this book you will have learned enough to build a complex biped robot that can walk turn find its way and see its environment **Learning BeagleBone Python Programming** Alexander

Hiam,2015-07-14 BeagleBone is a barebone computer that can be configured and customized for different applications and is almost half the price of a standard computer This book will cover the basics of how BeagleBone Black s hardware interface subsystems work and can be controlled using two popular Python libraries for BeagleBone Black You will be introduced to BeagleBone Black s GPIO PWM ADC UART SPI I2C and eQEP subsystems We will then dive deep into more complex built in peripherals demonstrating different ways to receive input from a user including buttons potentiometers and rotary encoders with the eQEP module We will also learn about interfacing with external devices this will be demonstrated using the serial modules to interface with external devices such as temperature sensors and accelerometers Towards the end of the book we will present a couple of real world problems and demonstrate how to solve them with the skills you ve acquired

Raspberry Pi Robotic Blueprints Richard Grimmett,2015-10-30 Utilize the powerful ingredients of Raspberry Pi to bring to life your amazing robots that can act draw and have fun with laser tags About This Book Learn to implement a number of features offered by Raspberry Pi to build your own amazing robots Understand how to add vision and voice to your robots This fast paced practical guide comprises a number of creative projects to take your Raspberry Pi knowledge to the next level Who This Book Is For This all encompassing guide was created for anyone who is interested in expanding their knowledge in applying the peripherals of Raspberry Pi If you have a fancy for building complex looking robots with simple inexpensive and readily available hardware then this book is ideal for you Prior understanding of Raspberry Pi with simple mechanical systems is recommended What You Will Learn Add sensors to your robot so that it can sense the world around it Know everything there is to know about accessing motors and servos to provide movement to the robotic platform Explore the feature of adding vision to your robot so it can see the world around it Refine your robot with the skill of speech recognition so that it can receive commands Polish your robot by adding speech output so it can communicate with the world around it Maximize the use of servos in Raspberry Pi to create a drawing robot Strengthen your robot by adding wireless communication skills so you can see what the robot is seeing and control it from a distance Build an unbelievable autonomous hexcopter controlled by Raspberry Pi In Detail The Raspberry Pi is a series of credit card sized single board computers developed in the UK by the Raspberry Pi Foundation with the intention of promoting the teaching of basic

computer science in schools The Raspberry Pi is known as a tiny computer built on a single circuit board It runs a Linux operating system and has connection ports for various peripherals so that it can be hooked up to sensors motors cameras and more Raspberry Pi has been hugely popular among hardware hobbyists for various projects including robotics This book gives you an insight into implementing several creative projects using the peripherals provided by Raspberry Pi To start we ll walk through the basic robotics concepts that the world of Raspberry Pi offers us implementing wireless communication to control your robot from a distance Next we demonstrate how to build a sensible and a visionary robot maximizing the use of sensors and step controllers After that we focus on building a wheeled robot that can draw and play hockey To finish with a bang we ll build an autonomous hexcopter that is a flying robot controlled by Raspberry Pi By the end of this book you will be a maestro in applying an array of different technologies to create almost any imaginable robot Style and approach This book is an easy to follow project based guide that throws you directly into the action of creating almost any imaginable robot through blueprints It is full of step by step instructions and screenshots to help you build amazing robots in no time at all

Programming the BeagleBone Yogesh Chavan,2016-01-28 Master BeagleBone programming by doing simple electronics and Internet of Things projects About This Book Quickly develop electronics projects that interact with Internet applications using JavaScript and Python Learn about electronics components such as sensors and motors and how to communicate with them by writing programs A step by step guide to explore the exciting world of BeagleBone from connecting BeagleBone to doing electronics projects and creating IoT applications Who This Book Is For If you want to learn programming on embedded systems with BeagleBone by doing simple electronics projects this book is for you This book is also helpful to BeagleBone owners who want to quickly implement small scale home automation solutions It is assumed that you have familiarity with C and Python programming Some familiarity with electronics is helpful but not essential What You Will Learn Connect your BeagleBone to a computer in different ways and get the Cloud9 IDE running to quick start programming on the BeagleBone Get to know about BeagleBone extension pins such as GPIO and how to connect various electronics components with BeagleBone Read and write to various electronics components such as LED Push button sensors and motors Grasp in depth theory on Analog PWM and BUS programming and the electronics components used in programs Handle data to and from various BUS supporting modules such as UART I2C and SPI using the Adafruit BBIO Python library Write real life IoT applications in JavaScript and Python such as shooting an e mail on overheat and controlling a servo motor remotely Make use of online free cloud services to store and analyze sensor data collected on the BeagleBone Discover what else can be done using the BeagleBone Get to grips with embedded system BUS communication In Detail The whole world is moving from desktop computers to smartphones and embedded systems We are moving towards utilizing Internet of Things IoT An exponential rise in the demand for embedded systems and programming in the last few years is driving programmers to use embedded development boards such as Beaglebone BeagleBone is an ultra small cost effective computer that comes with a

powerful hardware It runs a full fledged Debian Linux OS and provides numerous electronics solutions BeagleBone is open source and comes with an Ethernet port which allows you to deploy IoT projects without any additions to the board It provides plenty of GPIO Analog pins and UART I2C SPI pins which makes it the right choice to perform electronics projects This gives you all the benefits of Linux kernel such as multitasking multiusers and extensive device driver support This allows you to do programming in many languages including high level languages such as JavaScript and Python This book aims to exploit the hardware and software capabilities of BeagleBone to create real life electronics and IoT applications quickly It is divided into two parts The first part covers JavaScript programs The second part provides electronics projects and IoT applications in Python First you will learn to use BeagleBone as tool to write useful applications on embedded systems Starting with the basics needed to set up BeagleBone and the Cloud9 IDE this book covers interfacing with various electronics components via simple programs The electronics theory related to these components is then explained in depth before you use them in a program Finally the book helps you create some real life IoT applications

Style and approach An easy to follow guide full of real world electronics programs and quick troubleshooting tips using BeagleBone All the required electronics concepts are explained in detail before using them in a program and all programs are explained in depth Most of the theory is covered in the first part while the second part gives you some quick programs

BeagleBone Black Cookbook
Charles A. Hamilton, 2015-11-18 Over 60 recipes and solutions for inventors makers and budding engineers to create projects using the BeagleBone Black

About This Book Learn how to develop applications with the BeagleBone Black and open source Linux software Sharpen your expertise in making sophisticated electronic devices Explore the BeagleBone Black with this easy to succeed recipe format

Who This Book Is For If you are a hardware Linux and or microcomputing novice or someone who wants more power and possibilities with product prototypes electronic art projects or embedded computing experiments then this book is for you It is for Internet of Things enthusiasts who want to use more sophisticated hardware than the Raspberry Pi or the Arduino can provide Whether you are an engineering student a DIYer an inventor or a budding electronics enthusiast this book delivers accessible easy to succeed instructions for using an advanced microcomputing platform

What You Will Learn Set up and run the BeagleBone Black for the first time Learn the basics of microcomputing and Linux using the command line and easy kernel mods Make introductory projects with Python JavaScript BoneScript and Node.js Explore physical computing and simple circuits using buttons LEDs sensors and motors Discover the unique features of the BeagleBone Black and its real time computing functions Build intermediate level audio and video applications Assemble and add ingredients for creating Internet of Things prototypes

In Detail There are many single board controllers and computers such as Arduino Udoo or Raspberry Pi which can be used to create electronic prototypes on circuit boards However when it comes to creating more advanced projects BeagleBone Black provides a sophisticated alternative Mastering the BeagleBone Black enables you to combine it with sensors and LEDs add buttons and marry it to a variety of add on boards You can

transform this tiny device into the brain for an embedded application or an endless variety of electronic inventions and prototypes With dozens of how tos this book kicks off with the basic steps for setting up and running the BeagleBone Black for the first time from connecting the necessary hardware and using the command line with Linux commands to installing new software and controlling your system remotely Following these recipes more advanced examples take you through scripting debugging and working with software source files eventually working with the Linux kernel Subsequently you will learn how to exploit the board s real time functions We will then discover exciting methods for using sound and video with the system before marching forward into an exploration of recipes for building Internet of Things projects Finally the book finishes with a dramatic arc upward into outer space when you explore ways to build projects for tracking and monitoring satellites Style and approach This comprehensive recipe book deconstructs a complex often confusing piece of technology and transforms it to become accessible and fun with snappy unintimidating prose and extensive easy to succeed instructions

Raspberry Pi Robotic Projects - Third Edition Richard Grimmett,2016-10-11 Work through a mix of amazing robotic projects using the Raspberry Pi Zero or the Raspberry Pi 3About This Book Easy to follow instructions yet the ones that help you build powerful robots and exclusive coverage of mobile robots with the Pi Zero Build robots that can run swim and fly and the cutting edge dimension of robotics that is possible with the Raspberry Pi Zero and Pi 3 Interact with your projects wirelessly and make sci fi possible right in your homeWho This Book Is ForThis book is for hobbyists and programmers who are excited about using the Raspberry Pi 3 and Raspberry Pi Zero It is for those who are taking their first steps towards using these devices to control hardware and software and write simple programs that enable amazing projects No programming experience is required Just a little computer and mechanical aptitude and the desire to build some interesting projects What You Will Learn Control a variety of different DC motors Add a USB webcam to see what your robot can see Attach a projector to project information Insert USB control hardware to control a complex robot with two legs Include speech recognition so that your projects can receive commands Add speech output to that the robot can communicate with the world around it Include wireless communication so that you can see what the robot is seeing and control the robot from a distanceIn DetailThis book will allow you to take full advantage of Raspberry Pi Zero and Raspberry Pi 3 by building both simple and complex robotic projects The book takes a mission critical approach to show you how to build amazing robots and helps you decide which board to use for which type of robot The book puts a special emphasis on designing mobile or movable robots using the Raspberry Pi Zero The projects will show inexpensive yet powerful ways to take full advantage It will teach you how to program Raspberry Pi control the movement of your robot and add features to your robots Style and approachThis fun and practical tutorial contain step by step instructions to get you hands on building inexpensive projects It contains mission critical chapters and everything you need to know to get started

Unveiling the Magic of Words: A Overview of "**Beaglebone Robotic Projects Grimmiett Richard**"

In some sort of defined by information and interconnectivity, the enchanting power of words has acquired unparalleled significance. Their power to kindle emotions, provoke contemplation, and ignite transformative change is truly awe-inspiring. Enter the realm of "**Beaglebone Robotic Projects Grimmiett Richard**," a mesmerizing literary masterpiece penned by way of a distinguished author, guiding readers on a profound journey to unravel the secrets and potential hidden within every word. In this critique, we shall delve in to the book is central themes, examine its distinctive writing style, and assess its profound impact on the souls of its readers.

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Beaglebone Robotic Projects Grimmert Richard Introduction

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FAQs About Beaglebone Robotic Projects Grimmert Richard Books

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