الجمهورية اليمنية
وزارة التعليم العالي
الجامعة الامارتية الدولية
كلية الهندسة وتقنية المعلومات

جهاز الكشف المبكر عن سرطان الجلد

مشروع مقدم الى قسم هندسة الميكاترونكس في الجامعة الامارتية الدولية بهدف نيل شهادة البكالوريوس
الجمهورية اليمنية

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Introduction:

Cancer is one of the major healthcare burdens across the world. Global statistics suggest almost 10.0 million deaths (9.9 million excluding non-melanoma skin cancer) due to cancer in the year 2020. The most commonly diagnosed cancers include breast cancer in females, lung cancer, and prostate cancers. Lung, liver, and stomach cancers are the major contributors of cancer related deaths. Skin cancer, including both malignant melanoma and non-melanoma skin cancer (NMSC), are common cancers in Caucasians and their incidence is on the rise. According to the US Skin Cancer Foundation, skin cancer affects more people in the United States each year than all other cancers combined.

Melanoma is the skin cancer with the worst prognosis. If diagnosed early, it can be treated successfully with surgical procedures. However, once there is metastasis, rates of survival are reduced significantly. Diagnosis of melanoma depends on the clinical examination and classic findings on the lesion biopsy. Examples of NMSC include basal cell carcinoma (NMSC) and squamous cell carcinoma. The success of skin cancer depends on early diagnosis and appropriate treatment. Visual inspection may not be sufficient to differentiate benign lesions from malignant tumors. The gold standard procedure is histopathology examination of the skin biopsy.

The invasive nature of the procedure, associated pain, and the need for repeated samples in suspected lesions with varied presentations are some of the limitations for skin biopsy. Non-invasive tools can also assist in clinical diagnosis. Expertise, cost, and availability are the challenges for the widespread use of these tools.
Several advancements in science and technology have resulted in the availability of different non-invasive imaging methods to detect melanoma. The accuracy of these methods in the diagnosis of melanoma and other skin cancers is still a point of discussion.

Overall, early detection is key for the effective treatment and better outcomes of skin cancers. Specialists can accurately diagnose the cancer, however, considering their limited numbers, there is a need to develop automated systems, which can diagnose the disease efficiently to save lives and reduce health and financial burdens on the patients. Skin tumors can be difficult to recognize from common benign skin lesions, and melanoma has a particularly varied look. AI can aid in the early detection of skin cancer, lowering the burden of morbidity and mortality associated with the disease. In addition to reducing the workload, AI-based systems can also help by improving skin lesion diagnostics.

Artificial intelligence (AI), a branch of computer science that uses machines and programs to mimic intelligent human behavior via a constellation of technologies, is a key driver of the fourth industrial revolution. Machine learning (ML) is an AI technique involving statistical models and algorithms that can progressively learn from data to predict the characteristics of new samples and perform a desired task. Thus, the complex algorithms are designed to perform the tasks that otherwise would be difficult for human brains to do. Convolutional neural network (CNN) is a type of ML that simulates the processing of biological neurons and is the state-of-the-art network for pattern recognition in medical image analysis. AI is poised to bring transformation in healthcare because of its advantages over traditional analytical techniques.

There is rising optimism regarding applications of AI in healthcare, ranging from assistance in medical diagnostics, treatment and administrative support to reduce timelines of new drug development. It may also be of benefit as an adjuvant in clinical decision making. Dermatology, as a visually intensive field, is at the precipice of an AI revolution. The association for the advancement of AI defines it as "the scientific knowledge of the mechanisms underlying mind and intelligent behavior and its implementation in machines. AI uses computer systems to accomplish tasks that would ordinarily need human intelligence, such as identifying the type of flower or recognizing a person's voice.

To emulate the actions of the human brain, AI uses a variety of technologies and techniques, including robotics, ML, and the internet. AI has the potential to exceed humans, due to its endless processing power and storage capacity. Apple's Siri, Amazon's Alexa, and Google Assistant are the most popular instances of AI currently in use by ordinary people.

Because skin disease diagnosis is mostly based on visual perception, computer vision algorithms may be able to recognize skin lesions based on their morphology.

By September 2018, the US Food and Drug Administration (FDA) had authorized AI approaches for clinical usage, including devices to detect skin cancer from clinical photos obtained via a smartphone app.

The field of AI is growing dynamically, and research in this area is evolving at a rapid speed. The objective of this article is to provide update on usefulness of AI in diagnosis and management of skin cancer. We reviewed the latest research and key discoveries in ML encompassing various subfields of dermatology related cancers. Literature review was performed to screen the articles published in "PubMed" and "Google Scholar" through August 2021. The search words included "Artificial intelligence AND skin cancer" "Machine learning AND skin cancer" and "Deep learning AND skin cancer". Relevant references of the screened articles were also included for qualitative analysis. Important websites related to skin cancer and related AI resources were also browsed to gather information on the topic.

Project Background:

Skin cancer is the most common cancer type that affects humans. Melanoma and nonmelanoma are the two main types of skin cancer. Nonmelanoma is of lesser concern since it usually can be cured by surgery and is nonlethal. Melanoma, however, is the most dangerous skin cancer type, with a high mortality rate, although it represents less than 5% of all skin cancer cases. The World Health Organization (WHO) estimated 132,000 yearly melanoma cases globally. In 2015, 60,000 cases caused death.

Traditional methods of early detection of skin cancer include skin self-examination and skin clinical examination (screening). However, skin self-examination, where the patient or a family member notices a lesion, is a random method as people might overreact or underact. In addition, clinical examination using expensive, specialized medical tools, such as a dermoscope, microspectroscopy, and laser-based tools, requires training, effort to operate, time, and regular follow-ups. Thus, patients have started using mobile technologies, such as smartphones, to share images with their doctors to get faster diagnoses.

However, sharing images over the internet may compromise privacy. Worse yet, the image quality may not be sufficient, which may lead to inaccurate diagnoses. With evolvement, artificial intelligence (AI), which is the human-like intelligence exhibited by trained machines, has become so pervasive that most humans interact with AI-based tools daily, which assists physicians in decision making and decreases the decision variations among physicians.

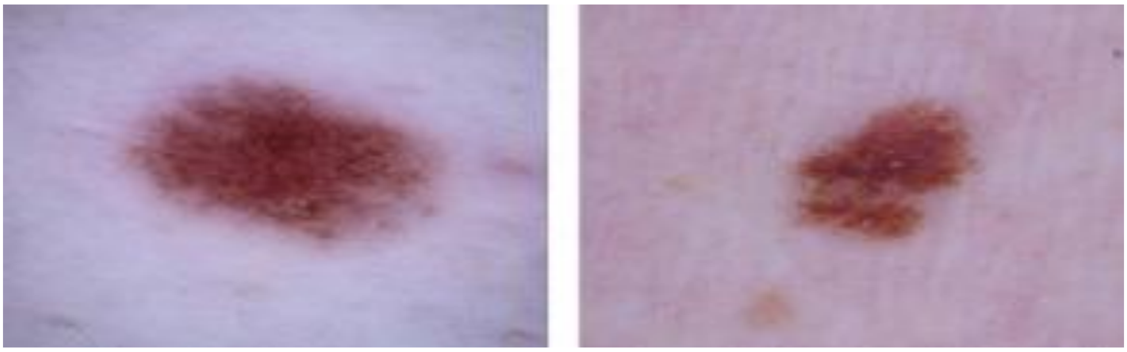
It is worth mentioning that even with the presence of such AI technologies, the role of an expert dermatologist is vital for diagnosis and treatment.

The focus of this review is on the use of AI as a tool that helps in the process of skin cancer diagnostics. Herein, AI-based skin cancer diagnostic tools use either shallow or deep AI methodologies. Both involve customizing computer algorithms through a process called training to learn from data formed by predefined features. The difference is that shallow methods tend to not use multilayer neural networks at all or use such networks limited to a minimum of layers. In contrast, deep methodologies involve training large, deep multilayer neural networks with many hidden layers, typically ranging from dozens to hundreds.

Problem Statement:

Detecting skin cancer can be challenging, time consuming, and relatively expensive. For example, Figure 1 shows two lesions that superficially seem identical. However, the left image is of a normal benign lesion, whereas the right image shows a melanoma lesion. As AI technologies are becoming smarter and faster, it is hardly surprising that they are being used to assist in diagnosing skin cancer and suggesting courses of action.
This is due to the fact that AI-based methods are considered to be relatively cheap, easy to use, and accessible. Thus, they offer the potential to overcome the issues inherent in the aforementioned existing skin cancer detection methods. However, as the literature on the medical use of AI quickly grows and continues to report findings using incompatible performance metrics, direct comparison between prior work becomes more challenging and threatens to hamper future research.

This study seeks to address this issue by performing a rigorous and transparent review of the existing literature. We aim to answer the research question, What are the existing AI-based tools that are used to detect and classify skin cancer?



Purpose and Objectives:

The main purpose of the project is to help people in need and detect the cancer before it spreads and been fatal to the people that who has cancer.

Primary care is where AI could make a big difference. More accurate assessment of skin lesions could lead to earlier diagnosis of skin cancer, potentially improving outcomes for patients and boosting survival rates. The burden on specialist dermatology services could also be reduced.

Objectives:

The aim of this study was to identify and group the different types of AI-based technologies used to detect and classify skin cancer. The study also examined the reliability of the selected papers by studying the correlation between the data set size and the number of diagnostic classes with the performance metrics used to evaluate the models.

Project Scope:

In this scoping review, we summarized the findings in the literature related to diagnosing skin cancer by using AI-based technology. We also categorized the papers included in this review based on the methodology used, the type of AI techniques, and their performance, and found the link between these aspects.

We noted that although all the papers included in this scoping review discuss the application and performance of a specific AI technology, the reporting is performed heterogeneously. A discussion of the relationship between using one specific AI technique and other aspects, such as data set size, or even a discussion of why the evaluation metric used is reasonable is normally not attempted.

This, of course, potentially hampers research in this direction, as it becomes harder for future studies to provide a comprehensive comparison with the existing work that follows scientific rigor.

This scoping review filled this gap by performing the necessary characterizations and analyses. This was achieved by grouping each of the used AI technologies into shallow and deep approaches, linking each type to the evaluation metrics used, listing and interpreting the number of diagnostic classes used in each study, and highlighting the dependency of performance on data set size and other factors. To the best of our knowledge, no similar work has been performed to fill this gap. In the Conclusion section, we will highlight our main findings.

Project Limitation:

This scoping review examined papers that were published between January 2009 and July 2021, and any published study outside this time line was excluded, which may have excluded older AI-based methods. In addition, we examined papers written in English; other languages were not included, which may have led to the exclusion of some studies conducted in other parts of the world.

Another limitation might be the gap between the time the research was performed and the time the work was submitted, which excluded published papers during that period. Although we applied all due diligence, a small residual chance of accidentally having overlooked papers in an academic database cannot be fully ruled out.

In addition, although we tried to discuss all findings in the literature, it is beyond the scope of this review to detail every single finding of the papers. Similarly, an investigation into data biases in the literature (imbalanced data with respect to diagnostic classes, patient ethnicity and skin color, gender, etc) is left as a direction for future studies.

And another limitation was getting the parts of this project, Parts like the Firefly 350 Scope and the Raspberry pi 4b.

We ordered this parts from Germany and they toke 2 months to arrive, Also the cost of this parts was very expensive.

Project Beneficial/Contribution:

There are advantages and disadvantages of introducing artificial intelligence at different points in the patient care pathway.

An artificial intelligence system used as a triaging tool before clinician assessment would enable automated risk stratification of individuals and/or lesions.

This approach could dramatically improve clinician workload and timely access to specialist care for people requiring urgent attention. Alternatively, artificial intelligence consulted following an examination by the clinician may act as a second opinion to improve diagnostic sensitivity and reduce unnecessary biopsies.

The latter is more closely aligned with current clinical workflows and therefore likely to be preferred while the field matures. There is

potential for over-reliance on artificial intelligence systems in both scenarios.
A secondary support system may provide the clinician with a diagnosis or a management decision. Doctors are more likely to change their minds if they are uncertain of a diagnosis and an algorithm provides a conflicting result.

It is thus important to consider how an algorithm might convey uncertainty to avoid false guidance.

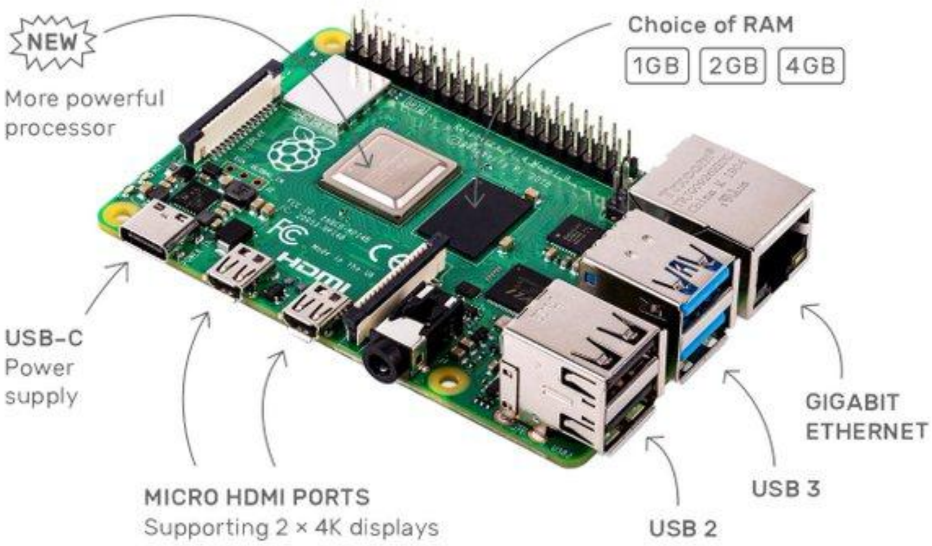
For example, a decision-support output (eg, excise, monitor or reassure) avoids the diagnostic dilemma of differentiating between melanoma and
dysplastic naevi. However, the problem is complex and arguments exist as to why, in many situations, a diagnostic probability output might be more desirable.

Conclusions:

The use of AI has high potential to facilitate the way skin cancer is diagnosed. Two main branches of AI are used to detect and classify skin cancer, namely shallow and deep techniques. However, the reliability of such AI tools is questionable since different data set sizes, image types, and number of diagnostic classes are being used and evaluated with different evaluation metrics.

Accuracy is the metric used most as a primary evaluation metric but does not allow for independently assessing FN and FP rates. This study found that higher accuracy scores are reported when fewer diagnostic classes are included. Interestingly and counterintuitively, our analysis also suggests that higher accuracy scores are reported when smaller sample sizes are included, which may be due to factors such as the type of images and the techniques used.

Furthermore, only independent, external validation using a large, diverse, and unbiased database is fit to demonstrate the generality and reliability of any AI technology prior to clinical deployment.


NEW
More powerful processor
Choice of RAM
1GB
2GB
4GB
USB-C
Power supply
MICRO HDMI PORTS
Supporting 2 × 4K displays
USB 2
USB 3
GIGABIT
ETHERNET


5V-DC


Firefly

Methodology

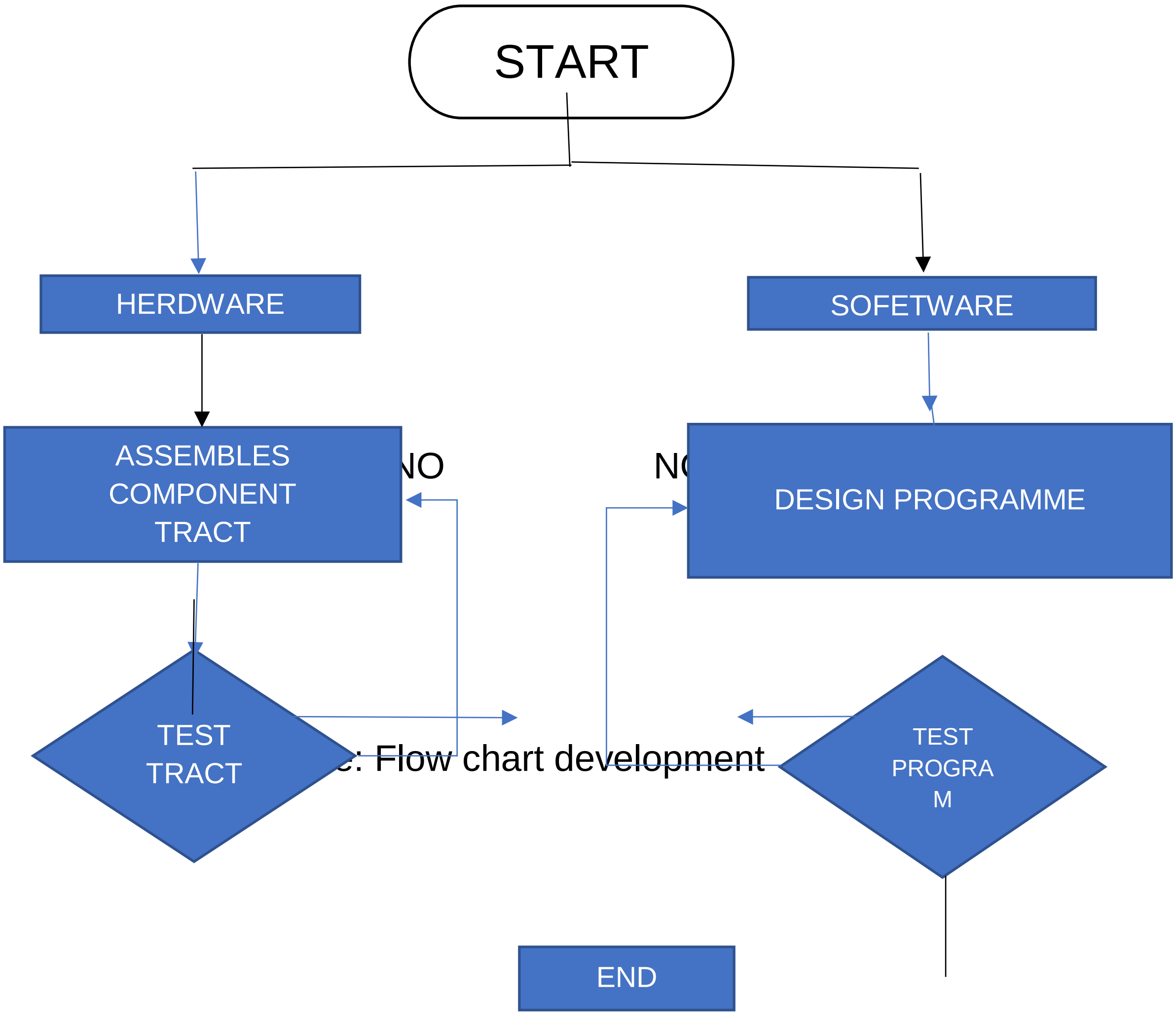
In this chapter, all of the flow of the whole project will briefly explain from start to the end

4.1 Introduction :

To make sure this project run smoothly, a survey on supporting components have been done. Supporting components in this case means components such as fan , Raspberry Pi , **firefly** and 5inch lcd. Information on these components can be obtained easily from normal component stores and have been recommended by the Supervisor for the most perfect type to be used. One thing to be remembered is the fact that each component picked must match in the system as so to balance it and not disrupt the inner workings of the project.

4.2 Project Development Flowchart :

Figure shows that the overall flow of the project. This includes all the process required from the start, literature review to final report submission. These are steps for the project to finish successfully .



e: Flow chart development

successfully .

PROJECT . HARDWARE

1-firefly

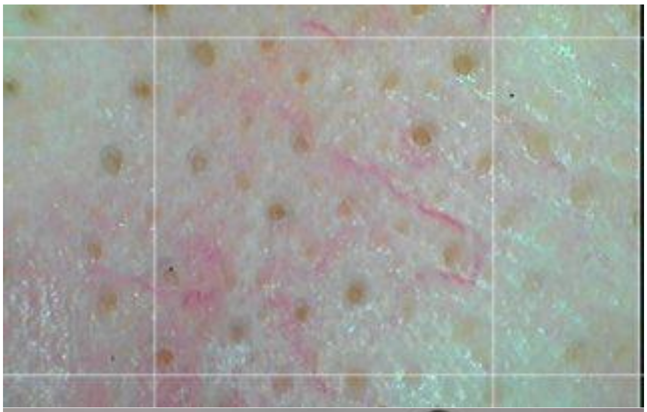
The DE350 Wireless Polarizing Dermatoscope (Dermascope) is a special purpose digital video camera combined with a high magnification polarizing lens and multiple ultra-bright LEDs.

Powered by 15x optical magnification, this innovative device streams high quality live video (at 30fps) to a computer, enabling the user to view and record images or videos.

The DE350 Wireless Polarizing Dermatoscope is used by some of the most reputable hospitals, clinics, and medical schools worldwide. Most common uses are for patient communication and education, keeping/sharing patient records, and documenting changes over time. Popular applications include clinical examinations, cosmetics, skin care and medical schools. It is also useful as a follicular scope to count hair follicles when conducting hair transplants, as well as in pre & post inspection for plastic surgery. The DE350 Dermatoscope is also perfect for telemedicine as it enables remote care providers to see close-up live images of the patient.

With its many uses and applications, the DE350 Wireless Polarizing Dermatoscope is a versatile, easy to use tool and is easy to acquire at a very affordable price. Please contact us for more information.

For Technical Specifications Click Here



Firefly

Firefly


Features

- Wirelessly captures pictures and videos
- Multiple levels of polarization
- See more patients and reduce patient visit time with more efficient record documenting
- Magnification: 45x (digital) and 15x (optical)
- Observes and records in real time (30 FPS)
- Transmits within a range up to 20ft
- Built-in snapshot button
- Multi-layered glass lenses
- Rugged industrialized construction
- Also consider the Dermascope DE300

Uses

- Dermatology
- Skin Examination
- Electronic Medical Records (EMR)
- Med Spas
- Hospitals and Clinics
- Medical Schools

What's Included

- Dermatoscope
- Wireless Receiver
- AC Outlet Charger
- USB Cable
- Velvet Carrying Case
- Quickstart Card

Technical Details	
Sensor Resolution	720×480
Magnification	Native Optical: 15x Digital: 45x
Wireless Link	4 Independent Channels
Battery	Built-in 850mAh
Lens Assembly	Dual Lenses 3-Layer Glass, 650nm cutoff
Video	Format: YUY2 Frame rate: Up to 30 FPS
Video/Image Properties	Color: 360 Level Hue, Saturation, White Balance Exposure: Brightness, Contrast Image: Sharpness, Gamma
Video, Image Files	BMP, JPG, AVI
Lighting	8 Ultra-Bright LEDs Fully adjustable brightness
Polarizer	12 settings in 30 degree increments
Dimensions	13cm x 3.6cm x 4cm
Interface	USB 2.0
Software	Scalable Window, Zoom, Freeze, Resolution, Rotate, Flip Region of Interest (ROI) Automatic/Manual white balance
Operating Systems	Windows 10, 8, 7, and Mac OS 10.8 or higher (Intel processors)
Warranty	1 Year Warranty

Firefly devices are intended to be used with the included software, but may also be integrated into 3rd party platforms. If you would like to use a 3rd party software package please contact us and we can provide integration guidelines.

For more information contact sales@fireflyglobal.com

Firefly on YouTube

2-5"LCD DISPLAY

Navigation menu

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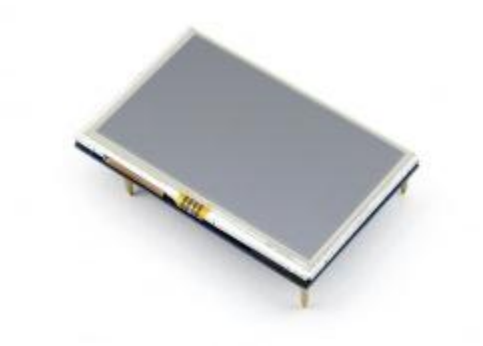
- AI
- Displays
- IoT
- Robotics
- MCU/FPGA
- Support

5inch HDMI LCD

5inch HDMI LCD
Designed for Raspberry Pi



5 inch Resistive Touch Screen LCD, HDMI interface
Designed for Raspberry Pi

5inch HDMI LCD (with bicolor case)

5inch HDMI LCD + Bicolor case

Introduction

5 inch Resistive Touch Screen LCD, HDMI interface, Designed for Raspberry Pi.

More

Features

- 800 x 480 hardware resolution.
- Resistive touch control.
- Compatible and Direct-connect with any revision of Raspberry Pi. (If you are using a Raspberry Pi Zero / Zero 2 W, an additional HDMI cable is required).
- Supports Raspberry Pi OS / Ubuntu / Kali and Retropie systems.
- Also works as a computer monitor, in this case, touch panel is unavailable and HDMI cable is required.
- HDMI interface for displaying, no I/Os required (however, the touch panel still needs I/Os).
- Support backlight control, more power saving.

Note: This LCD can only be used with Raspberry Pi and cannot be used with PC.

Video

Getting Started

Hardware Connection

1. Connect the GPIO interface

Raspberry Pi leads out 40 GPIO pins, while the screen leads out 26 pins. When connecting, pay attention to the corresponding pins and Raspberry Pi pins.

2. Connect the HDMI connector to the HDMI port of the screen and the Pi.

Note: Raspberry Pi Zero / Zero 2 W needs an additional HDMI cable for connection.

3. Turn the Backlight on the back of the LCD to "ON".

Software Setting

This LCD can support Raspberry Pi OS / Ubuntu / Kali / Retropie systems.

Please download the latest version of the image on the [Raspberry Pi official website.]()

1) Download the compressed file to the PC, and unzip it to get the .img file.

2) Connect the TF card to the PC, use [SDFormatter]() software to format the TF card.

3) Open the [Win32DiskImager]() software, select the system image downloaded in step 1, and click 'Write' to write the system image.

4) After the image has finished writing, open the config.txt file in the root directory of the TF card, add the following code at the end of config.txt, then save and quit the TF card safely.

```
hdmi_group=2
hdmi_mode=87
hdmi_cvt 800 480 60 6 0 0 0
hdmi_drive=1
dtoverlay=ads7846,cs=1,penirq=25,penirq_pull=2,speed=50000,keep_vref_on=0,sw
apxy=0,pmax=255,xohms=150,xmin=200,xmax=3900,ymin=200,ymax=3900
```

5) Insert the TF card into the Raspberry Pi, power on the Raspberry Pi, and wait for more than 10 seconds to display normally. But the touch is abnormal at that time, and the touch needs to be calibrated as the following steps.

Touch calibration

The display can be calibrated via xinput-calibrator.

1. Execute the following command to install the relevant software:

```
sudo apt-get install xserver-xorg-input-evdev xinput-calibrator
```

If the execution fails, you can check here[#Some possible problems]

2. Execute the following commands:

```
sudo cp -rf /usr/share/X11/xorg.conf.d/10-evdev.conf
/usr/share/X11/xorg.conf.d/45-evdev.conf
sudo nano /usr/share/X11/xorg.conf.d/99-calibration.conf
```

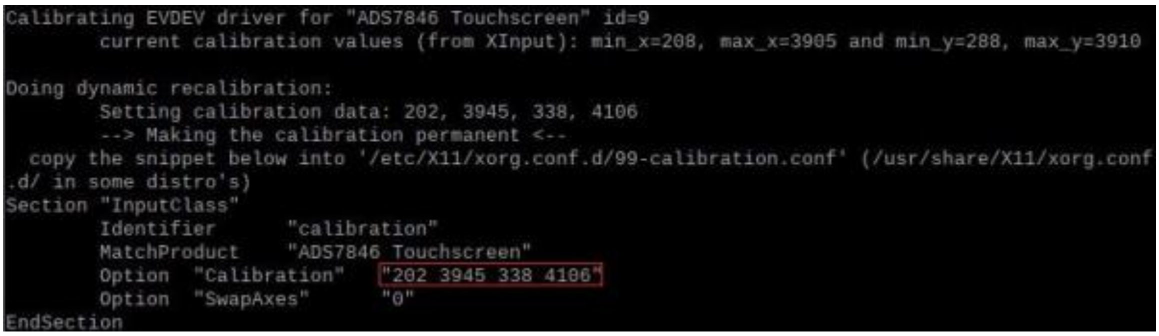
Add the following code to 99-calibration.conf:

```
Section "InputClass"
        Identifier      "calibration"
        MatchProduct    "ADS7846 Touchscreen"
        Option  "Calibration"   "208 3905 288 3910"
        Option  "SwapAxes"      "0"
        Option "EmulateThirdButton" "1"
        Option "EmulateThirdButtonTimeout" "1000"
        Option "EmulateThirdButtonMoveThreshold" "300"
EndSection
```

3. After reboot, touch will work normally under normal circumstances. But for different resistance screens, the accuracy of using the default calibration parameters may not be very suitable.

You can perform touch calibration by clicking the Raspberry Pi icon on the taskbar, selecting Preferences -> Calibrate Touchscreen, and following the displayed prompts.

4. After calibration, the following data will be displayed. If you want to save these touch values, you can replace the data in the red circle with the data in the corresponding position in 99-calibration.conf.



Screen orientation settings

Update software version

Raspberry Pi OS Bullseye branch needs to update the software version, and this step can be omitted for other systems.

```
sudo apt-get update
sudo apt-get full-upgrade
```

Raspberry Pi OS and Kali display rotation

First check whether the KMS or FKMS driver is loaded on the system you are using.

Check method: In /boot/config.txt, check whether the line dtoverlay=vc4-kms-v3d or dtoverlay=vc4-fkms-v3d is turned on.

With KMS or FKMS driver loaded

Use the following command for display rotation:

```
sudo nano /etc/xdg/lxsession/LXDE-pi/autostart
#Enter the command corresponding to the display rotation angle at the end of
the autostart file, and it will take effect after rebooting the system.
#0: rotate 0 degrees; 1: rotate 270 degrees; 2: rotate 180 degrees; 3:
rotate 90 degrees
xrandr -o 1
```

No KMS or FKMS driver loaded

Use the following command for display rotation:

```
sudo nano /boot/config.txt
#Enter the command corresponding to the display rotation angle at the end of
the config.txt file, and it will take effect after rebooting the system.
#0: rotate 0 degrees; 1: rotate 90 degrees; 2: rotate 180 degrees; 3: rotate
270 degrees
display_rotate=3
```

Ubuntu display rotation

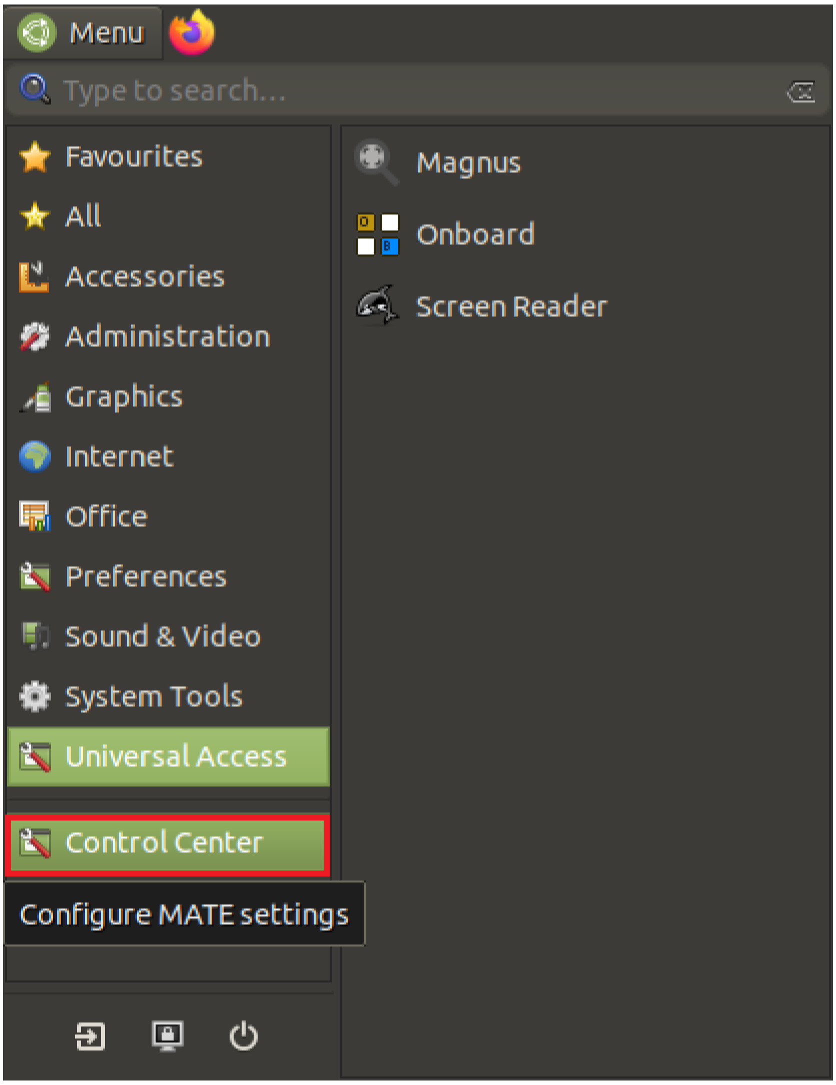
First check whether the KMS or FKMS driver is loaded on the system you are using.

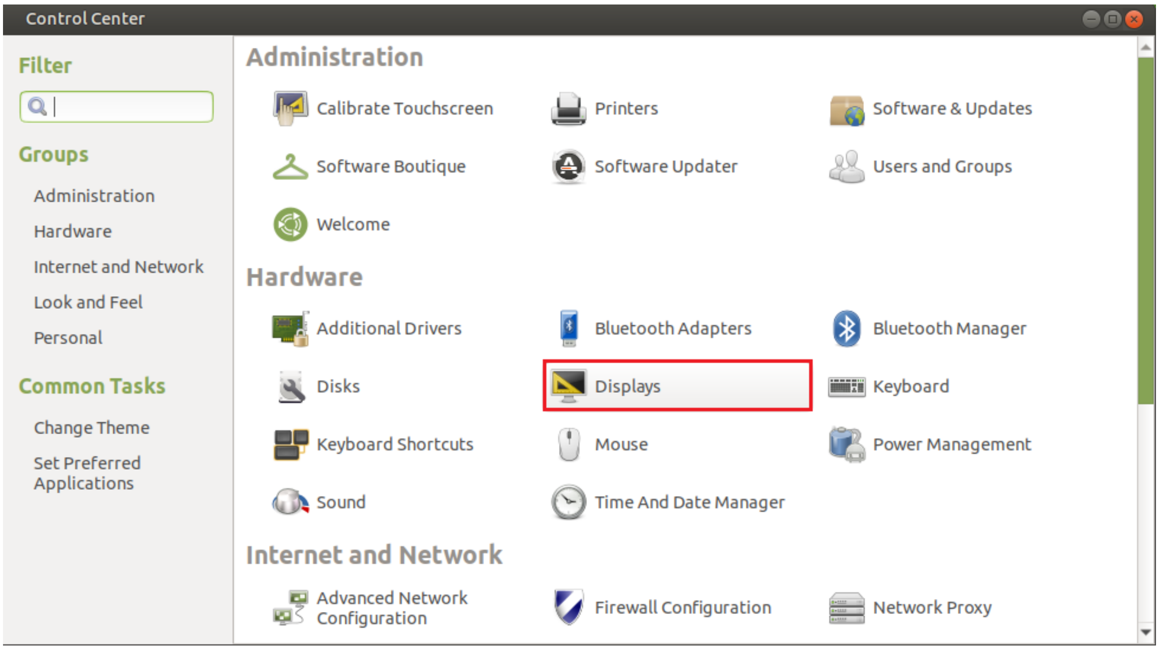
Check method: In /boot/firmware/config.txt, check whether the line dtoverlay=vc4-kms-v3d or dtoverlay=vc4-fkms-v3d is turned on.

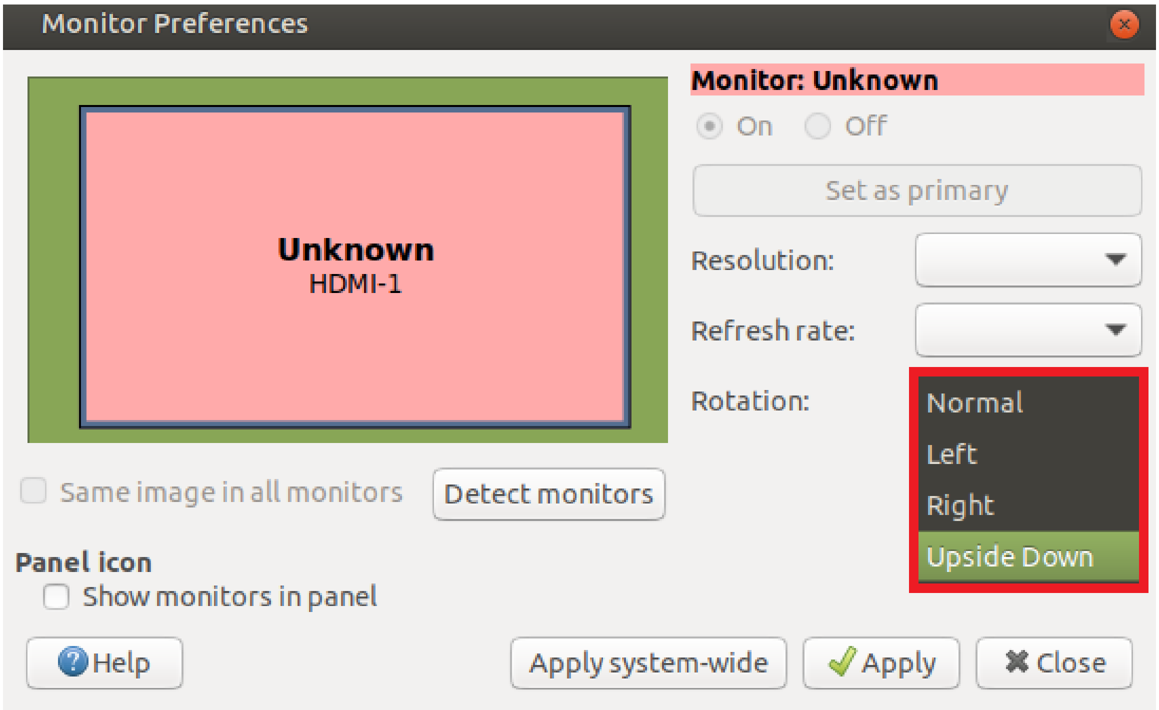
With KMS or FKMS driver loaded

Use the following methods for display rotation.

Note: For different versions of Ubuntu systems, the interface may be different. Generally, you can find the Displays application and rotate it.


Menu
Type to search...
Favourites
All
Accessories
Administration
Graphics
Internet
Office
Preferences
Sound & Video
System Tools
Universal Access
Control Center
Configure MATE settings
Magnus
Onboard
Screen Reader


Control Center
Filter
Groups
Administration
Hardware
Internet and Network
Look and Feel
Personal
Common Tasks
Change Theme
Set Preferred Applications
Administration
Calibrate Touchscreen
Printers
Software & Updates
Software Boutique
Software Updater
Users and Groups
Welcome
Hardware
Additional Drivers
Bluetooth Adapters
Bluetooth Manager
Disks
Displays
Keyboard
Keyboard Shortcuts
Mouse
Power Management
Sound
Time And Date Manager
Internet and Network
Advanced Network Configuration
Firewall Configuration
Network Proxy



Execute the command to rotate the Ubuntu login interface. If the Ubuntu login interface is not opened, this step can be omitted:

```
#For 32-bit systems, execute the following command, replace your_user with
the currently logged in user name
sudo cp /home/<your_user>/.config/monitors.xml /var/lib/lightdm/.config
#For 64-bit systems, execute the following command, replace your_user with
the currently logged in user name
sudo cp /home/<your_user>/.config/monitors.xml /var/lib/gdm3/.config
sudo chown gdm:gdm /var/lib/gdm3/.config/monitors.xml
```

Execute the following command to rotate the command line display during startup:

```
sudo nano /boot/firmware/cmdline.txt
#Add the following code at the end to rotate the command line
#rotate 0 degrees
fbcon=rotate:0 video=HDMI-A-1:800x480M@60,rotate=0
#Rotate 90 degrees
fbcon=rotate:3 video=HDMI-A-1:800x480M@60,rotate=90
#rotate 180 degrees
fbcon=rotate:2 video=HDMI-A-1:800x480M@60,rotate=0
#rotate 270 degrees
fbcon=rotate:1 video=HDMI-A-1:800x480M@60,rotate=270
```

No KMS or FKMS driver loaded

Rotation is relatively simple, just use the following command to display rotation:

```
sudo nano /boot/firmware/config.txt
#Enter the command corresponding to the display rotation angle at the end of
the config.txt file, and it will take effect after rebooting the system.
#0: rotate 0 degrees; 1: rotate 90 degrees; 2: rotate 180 degrees; 3: rotate
270 degrees
display_rotate=3
```

Add touch rotation parameter

```
sudo nano /usr/share/X11/xorg.conf.d/99-calibration.conf
#Modify the
```

```
relevant command line in the 99-calibration.conf file, and it will take
effect after rebooting the system. The following are the default calibration
parameters. If you need to use specific calibration parameters, please pay
attention to the order of the Calibration parameter values.
#touch rotate 0 degrees:
Option "Calibration" "208 3905 288 3910"
Option "SwapAxes" "0"
#touch rotate 90 degrees:
Option "Calibration" "3905 208 288 3910"
Option "SwapAxes" "1"
#touch rotate 180 degrees:
Option "Calibration" "3905 208 3910 288"
Option "SwapAxes" "0"
#touch rotate 270 degrees:
Option "Calibration" "208 3905 3910 288"
Option "SwapAxes" "1"
```

Disable power saving

If you want to keep the display turning on all the time, you can disable the power saving function.
Modify file lightdm.conf

```
sudo nano /etc/lightdm/lightdm.conf
```

Find the [SeatDefaults] option and uncomment the line"xserver-command", modify it as below:

```
#xserver-command=X
```

Modify this code to

```
xserver-command=X -s 0 -dpms
```

- -s # –Disable the display protecting.
- dpms Disable power saving.

Reboot

```
sudo reboot
```

Interface

PIN NO.	SYMBOL	DESCRIPTION
1, 17	3.3V	Power positive (3.3V power input)
2, 4	5V	Power positive (5V power input)
3, 5, 7, 8, 10, 11, 12, 13, 15, 16, 18, 24	NC	NC
6, 9, 14, 20, 25	GND	Ground
19	TP_SI	SPI data input of Touch Panel
21	TP_SO	SPI data output of Touch Panel
22	TP_IRQ	Touch Panel interrupt, low level while the Touch Panel detects touching

23	TP_SCK	SPI clock of Touch Panel
26	TP_CS	Touch Panel chip selection, low active

Some possible problems

Touch jitter so obvious, how to solve it?

De-jitter parameters can be set to solve the problem of touch jitter, but at the cost of sacrificing a part of the sensitivity.

Since the ads7846.dtbo provided by Raspberry Pi by default has no de-jitter parameters, you can increase the de-jitter parameters by modifying and replacing ads7846.dtbo

Specifically, the anti-shake function can be added in the following method:

1.Execute the following command：

```
wget https://www.waveshare.net/w/upload/2/29/Ads7846_waveshare.zip
unzip Ads7846_waveshare.zip
cd ads7846_waveshare
sudo cp ads7846_waveshare.dtbo /boot/overlays/
```

2.Execute the following command：

```
sudo nano /boot/config.txt
#Comment out the following line:
#dtoverlay=ads7846,cs=1,penirq=25,penirq_pull=2,speed=50000,keep_vref_on=0,s
wapxy=0,pmax=255,xohms=150,xmin=200,xmax=3900,ymin=200,ymax=3900
#Add the following command at the end of the config.txt file, it will take
effect after rebooting the system.
dtoverlay=ads7846_waveshare
```

Related reference documents：ads7846-overlay.dts ads7846.txt

The installation of xserver-xorg-input-evdev and xinput-calibrator in Ubuntu system reports an error, so the touch cannot be used normally. How to solve it?

Note: The Ubuntu system may not be able to access the default source due to network problems in some regions, resulting in an installation error.

Solution 1, update the source:

1. Execute the command to view the current version:

```
lsb_release -c -s
```

For example, after execution, the system version may be: groovy

2. Execute the commands:

```
#backup the original source
```

```
sudo mv /etc/apt/syntaxhighlights.list /etc/apt/syntaxhighlights.list.old
sudo nano /etc/apt/syntaxhighlights.list
```

Add the following code and save:

```
#If your system version is not groovy, please replace the following groovy
with the version name obtained in step 1
deb http://old-releases.ubuntu.com/ubuntu/ groovy universe main
deb http://old-releases.ubuntu.com/ubuntu/ groovy-security main universe
deb http://old-releases.ubuntu.com/ubuntu/ groovy-updates main universe
```

3. Execute the command to update:

```
sudo apt-get update
```

4. After the update is complete, run [#Touch calibration] again.

If the above source fails, the following methods can be used:

Solution 2, directly find the download address of the two applications, download and install directly

For 32-bit systems, execute the following commands:

```
wget http://deb.debian.org/debian/pool/main/x/xserver-xorg-input-
evdev/xserver-xorg-input-evdev_2.10.6-2_armhf.deb
sudo dpkg -i xserver-xorg-input-evdev_2.10.6-2_armhf.deb
wget wget http://mirrors.ustc.edu.cn/debian/pool/main/x/xinput-
calibrator/xinput-calibrator_0.7.5+git20140201-1+b2_armhf.deb
sudo dpkg -i xinput-calibrator_0.7.5+git20140201-1+b2_armhf.deb
```

For 64-bit systems, execute the following commands:

```
wget http://deb.debian.org/debian/pool/main/x/xserver-xorg-input-
evdev/xserver-xorg-input-evdev_2.10.6-2_arm64.deb
sudo dpkg -i  xserver-xorg-input-evdev_2.10.6-2_arm64.deb
wget http://mirrors.ustc.edu.cn/debian/pool/main/x/xinput-calibrator/xinput-
calibrator_0.7.5+git20140201-1+b2_arm64.deb
sudo dpkg -i xinput-calibrator_0.7.5+git20140201-1+b2_arm64.deb
```

The installation of xserver-xorg-input-evdev and xinput-calibrator in Kali system reports an error, so the touch cannot be used normally. How to solve it?

Note: The Kali system may not be able to access the default source due to network problems in some regions, resulting in an installation error.

Solution 1, update the source:

1. Execute sudo su to obtain administrator privileges. The default password is kali.

2. Execute the command:

```
wget -q -O - https://archive.kali.org/archive-key.asc | apt-key add
```

3. Execute the command to modify the source:

```
nano /etc/apt/syntaxhighlights.list
```

Comment out the original source and modify it to:

```
deb http://mirrors.ustc.edu.cn/kali kali-rolling main contrib non-free
```

Save and exit.

4. Execute the command to update:

```
apt-get update --fix-missing
```

5. After the update is complete, run #Touch calibration again.

If the above source fails, the following methods can be used:

Solution 2, directly find the download address of the two applications, download and install directly

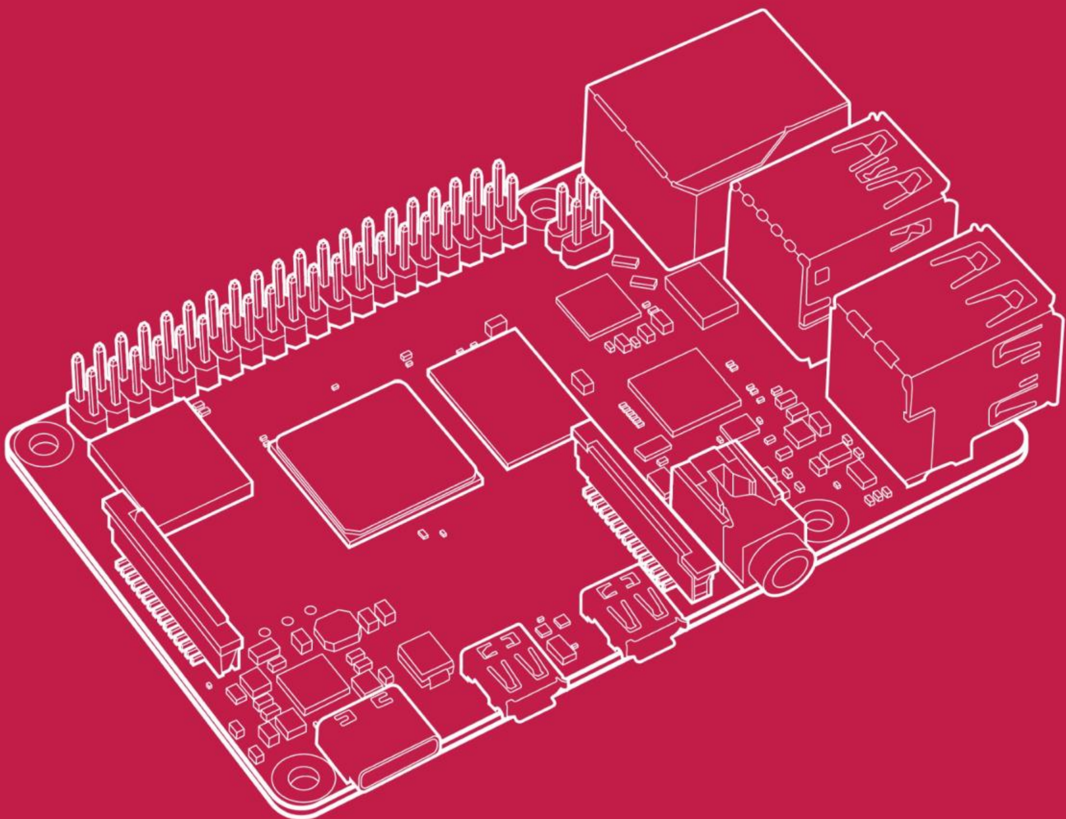
For 32-bit systems, execute the following commands:

```
wget http://deb.debian.org/debian/pool/main/x/xserver-xorg-input-
evdev/xserver-xorg-input-evdev_2.10.6-2_armhf.deb
sudo dpkg -i xserver-xorg-input-evdev_2.10.6-2_armhf.deb
wget wget http://mirrors.ustc.edu.cn/debian/pool/main/x/xinput-
calibrator/xinput-calibrator_0.7.5+git20140201-1+b2_armhf.deb
sudo dpkg -i xinput-calibrator_0.7.5+git20140201-1+b2_armhf.deb
```

For 64-bit systems, execute the following commands:

```
wget http://deb.debian.org/debian/pool/main/x/xserver-xorg-input-
evdev/xserver-xorg-input-evdev_2.10.6-2_arm64.deb
osudo dpkg -i  xserver-xorg-input-evdev_2.10.6-2_arm64.deb
wget http://mirrors.ustc.edu.cn/debian/pool/main/x/xinput-calibrator/xinput-
calibrator_0.7.5+git20140201-1+b2_arm64.deb
sudo dpkg -i xinput-calibrator_0.7.5+git20140201-1+b2_arm64.de
```

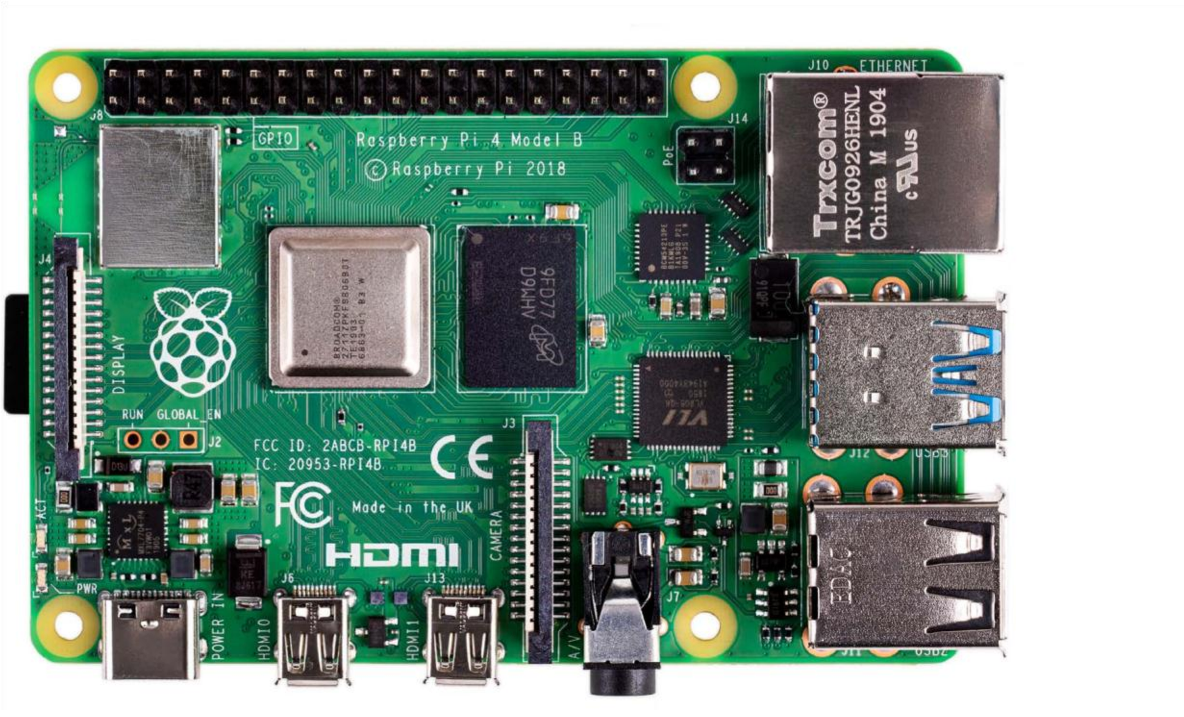
Raspberry Pi 4 Computer
Model B



Published in June
by Raspberry Pi

Raspberry Pi

Overview



Raspberry Pi 4 Model B is the latest product in the popular Raspberry Pi range of computers. It offers ground-breaking increases in processor speed, multimedia performance, memory, and connectivity compared to the prior-generation Raspberry Pi 3 Model B+, while retaining backwards compatibility and similar power consumption. For the end user, Raspberry Pi 4 Model B provides desktop performance comparable to entry-level x86 PC systems.

This product's key features include a high-performance 64-bit quad-core processor, dual-display support at resolutions up to 4K via a pair of micro-HDMI ports, hardware video decode at up to 4Kp60, up to 4GB of RAM, dual-band 2.4/5.0 GHz wireless LAN, Bluetooth 5.0, Gigabit Ethernet, USB 3.0, and PoE capability (via a separate PoE HAT add-on).

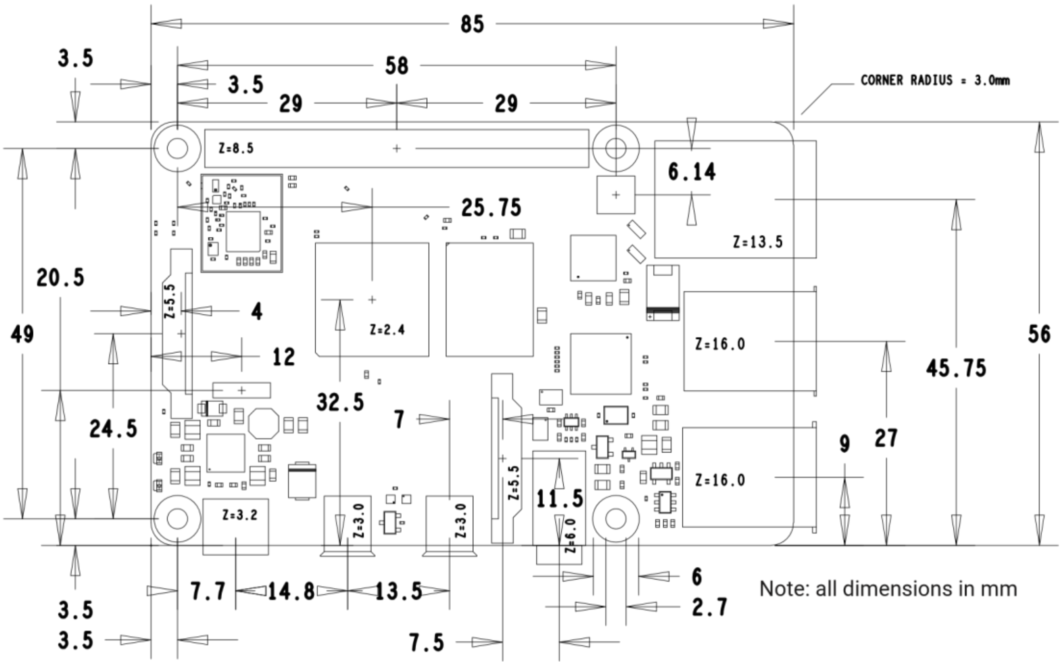
The dual-band wireless LAN and Bluetooth have modular compliance certification, allowing the board to be designed into end products with significantly reduced

Specification

Processor:	Broadcom BCM2711, quad-core Cortex-A72 (ARM v8) 64-bit SoC @ 1.5GHz
Memory:	1 GB, 2GB or 4GB LPDDR4 (depending on model)

Connectivity:	2 .4 GHz and 5.0 GHz IEEE 802.11b/g/n/ac wireless LAN, Bluetooth 5.0, BLE Gigabit Ethernet 2 × USB 3.0 ports 2 × USB 2.0 ports.
GPIO:	Standard 40-pin GPIO header (fully backwards-compatible with previous boards)
Video & sound:	2 × micro HDMI ports (up to 4Kp60 supported) 2-lane MIPI DSI display port 2-lane MIPI CSI camera port 4-pole stereo audio and composite video port
Multimedia:	H .265 (4Kp60 decode); H.264 (1080p60 decode, 1080p30 encode); OpenGL ES, 3.0 graphics
SD card support:	Micro SD card slot for loading operating system and data storage
Input power:	5V DC via USB-C connector (minimum 3A[1]) 5V DC via GPIO header (minimum 3A[1]) Power over Ethernet (PoE)–enabled (requires separate PoE HAT)
Environment:	Operating temperature 0–50ºC
Compliance:	F or a full list of local and regional product approvals, please visit https://www.raspberrypi.org/documentation/hardware/raspberrypi/conformity.md
Production lifetime:	T he Raspberry Pi 4 Model B will remain in production until at least January 2026.

Physical Specifications



WARNINGS

- This product should only be connected to an external power supply rated at 5V/3A DC or 5.1V/ 3A DC minimum[1]. Any external power supply used with the Raspberry Pi 4 Model B shall comply with relevant regulations and standards applicable in the country of intended use.
- This product should be operated in a well-ventilated environment and, if used inside a case, the case should not be covered.
- This product should be placed on a stable, flat, non-conductive surface in use and should not be contacted by conductive items.
- The connection of incompatible devices to the GPIO connection may affect compliance and result in damage to the unit and invalidate the warranty.
- All peripherals used with this product should comply with relevant standards for the country of use and be marked accordingly to ensure that safety and performance requirements are met. These articles include but are not limited to keyboards, monitors and mice when used in conjunction with the Raspberry Pi.
- Where peripherals are connected that do not include the cable or connector, the cable or connector must offer adequate insulation and operation in order that the relevant performance and safety requirements are met.

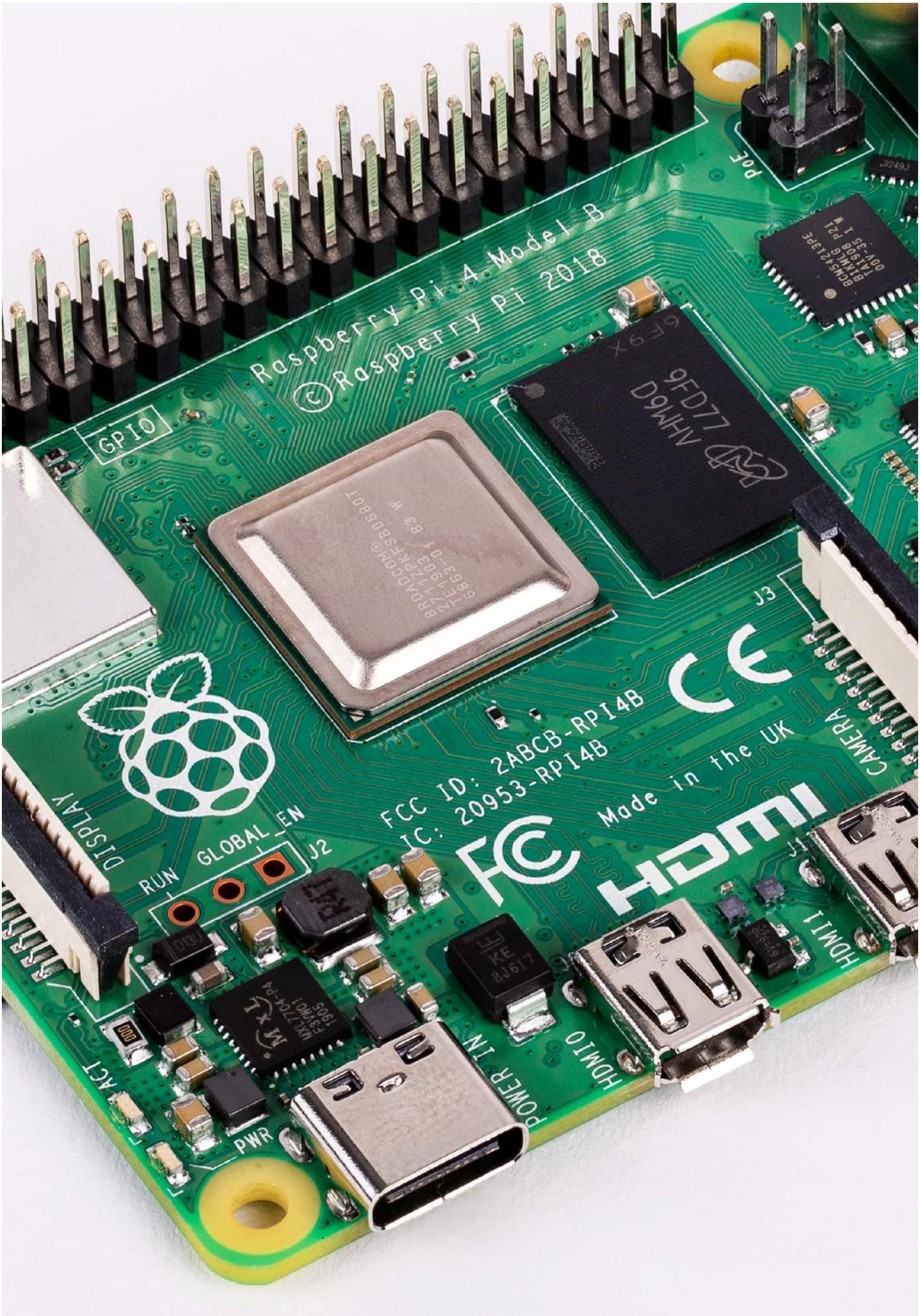
SAFETY INSTRUCTIONS

To avoid malfunction or damage to this product please observe the following:

- Do not expose to water, moisture or place on a conductive surface whilst in operation.

[1] A good quality 2.5A power supply can be used if downstream USB peripherals consume less than 500mA in total.

- Do not expose it to heat from any source; Raspberry Pi 4 Model B is designed for reliable operation at normal ambient room temperatures.
- Take care whilst handling to avoid mechanical or electrical damage to the printed circuit board and connectors.


Raspberry Pi 4 Model B
©Raspberry Pi 2018
GPIO
PoE
J3
CAMERA
DISPLAY
GLOBAL_EN
RUN
J2
FCC ID: 2ABCB-RPI4B
IC: 20953-RPI4B
Made in the UK
HDMI
HDMI0
HDMI1
POWER IN
PWR
ACT

to minimise the risk of electrostatic discharge damage.

5-fans

-

Housing Material: High Quality Plastic Housing
Package include: 1 Piece
Rated Power:DC 12V – 0.08Amp
Speed:12000RPM
Air flow:4.8CFM 28dBA
Connecter:XH2.54-2P
Cable Length:13cm
Voltage : 5V
2 wire

5-Raspberry pi fan

1. Housing Material: High Quality Plastic Housing

   Package include: 1 Piece

   Rated Power : DC 5V – 0.04Amp

   Speed : 8000RPM

   Air flow:4.8CFM 28dBA

   Connecter:XH1.54-2P

   Cable Length:8cm

   Voltage : 5V

   2 wire

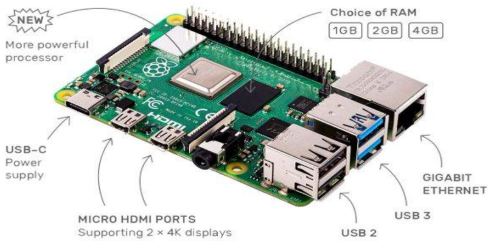
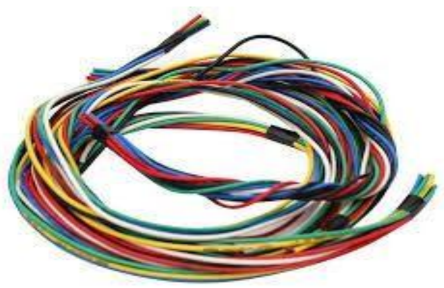
App.endix

Cod for Raspberry pi programming

Appendix B

Estimated cost of project.

No	ITEM	QTY	COST
1	**Firefly**  	1	600$
2	5inch lcd 	1	80$

3	**Raspberry pi**  	1	160$
4	Fan raspberry pi 	2	50$
5	Wire 	5	4$

<table>
<tr><td>6</td><td>Power supply 12v</td><td>1</td><td>5$</td></tr>
<tr><td>7</td><td>GLU



</td><td></td><td>20$</td></tr>
<tr><td colspan="3">Total coast</td><td>1020$</td></tr>
</table>