

**Tutorial No. 2**

* **Q1. Q1. What is MIPI-CSI 2?**
* **Ans:-**
* 1) MIPI Camera Serial Interface 2 (MIPI CSI-2) is a standard for connecting digital cameras to mobile devices and other devices that support MIPI interfaces.
* 2) It is a high-speed, low-power, serial interface that allows for the transfer of image data from a camera sensor to the image processor in a mobile device.
* 3) MIPI CSI-2 supports multiple data lanes, allowing for high-bandwidth image data transfer, and is widely used in mobile devices, drones, and other portable devices that require high-quality image capture capabilities.
* **Q2. Explain the setup requirement for Pi-camera on Raspberry Pi-4 module**
* **Ans:-**
* 1) check if the raspberry pi is of latest version and its working properly.
* 2) find the camera connector on raspberry pi board.
* 3) to use the camera in python in python use “ pip install picamera ” in terminal
* 4) now connect the camera connector to raspberry pi board .
* 5) raspberry pi setup for camera
* - enable camera interface by running command - “sudo raspi-config”
* - now navigate to interfacing options
* - select camera their
* 6) now cameca is setup on pi board
* - “raspistill -o test.jpg” to take image
* **Q3. Explain the following functions of PiCamera Class**
* **1) PiCamera =**
* class is the main class for controlling the Raspberry Pi Camera in Python. It provides a way to access and control the camera's settings, such as resolution, framerate, and exposure, as well as methods for capturing images and videos.
* **2. PiVideoFrameType**
* The PiVideoFrameType is an enumeration class that defines the different types of video frames that can be captured by the PiCamera class. The possible frame types are:
* - PiVideoFrameType.frame: A standard video frame
* - PiVideoFrameType.bayer: A bayer-encoded video frame
* - PiVideoFrameType.motion\_data: Motion data video frame
* **3. PiVideoFrame**
* The PiVideoFrame class provides an interface for manipulating video frames captured by the PiCamera class. It includes properties and methods for accessing the frame's data, size, and format, as well as for converting the frame to different formats.
* **4. PiResolution**
* The PiResolution class defines the resolution of the camera. It is used to set the resolution of the camera and can be used to get the current resolution of the camera
* **5. PiFramerateRange**
* The PiFramerateRange class defines the range of framerates that the camera is capable of capturing. It is used to set the framerate of the camera and can be used to get the current framerate of the camera.

[**https://picamera.readthedocs.io/en/release-1.13/api\_camera.html#**](https://picamera.readthedocs.io/en/release-1.13/api_camera.html#)

* **Q4. How is the MIPI standard being used to provide connectivity in automotive, Mobile, virtual reality, and augmented reality applications?**
* **AUtomotiv:-**
* Cameras, sensors, and other components in advanced driver assistance systems (ADAS) and driverless vehicles are connected using MIPI interfaces. For image processing and perception, high-resolution cameras are connected to the car's onboard computer using MIPI CSI-2, for instance. For applications such as infotainment and instrument cluster displays, the vehicle's displays are connected using MIPI DSI and D-PHY.

**Virtual Reality (VR) and Augmented Reality (AR):**

MIPI interfaces are used to connect cameras and displays in VR and AR headsets. MIPI CSI-2 is used to connect cameras to the headset's onboard computer for image processing, and MIPI DSI and D-PHY are used to connect displays to the headset's main processor.

Overall, MIPI standard provides a scalable, low-power solution for connecting different components in various devices, enabling the development of high-performance, low-power systems in these industries.