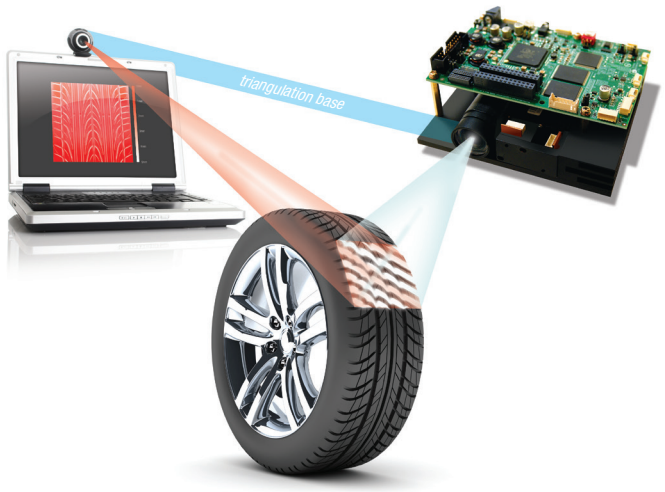
Highly Scalable TI DLP® Technology for 3D Machine Vision

Get more speed and accuracy with structured light using TI DLP® technology

TEXAS INSTRUMENTS

3D machine vision is a fast and accurate optical technique used to capture physical measurements of an object. With the digitized 3D scan data, the dimensions of any object—including surface area, volume, and feature size—can be extracted. Structured light is an optical method of 3D scanning where a series of patterns are projected upon an object and a camera or sensor detects distortions of the patterns. Image processing and triangulation algorithms then convert these distortions into a 3D point cloud. The point cloud can be used directly for analysis of the object or easily exported to a variety of CAD modeling formats.

TI DLP technology enables programmable structured light solutions for portable and high resolution applications. DLP systems can produce non-contact, highly accurate 3D data in real-time, facilitating 3D Machine Vision.



Features and benefits

- Fast, programmable pattern rates up to 32 kHz
  - Acquire 3D scan data in real-time on moving objects
  - Optimize scan speed and accuracy for multiple objects and environments using adaptive pattern sets
- Precise depth capture
  - Achieve measurement accuracy to µm level
- Digital switching using reflective, reliable MEMS micromirrors
  - Minimal sensitivity to color, distance, movement and environment improves performance over time and temperature
- Active illumination with LEDs, lasers, or lamps
  - Multiple wavelengths for scanning a wide range of materials
  - Enables strong low light performance

DLP solutions for 3D machine vision

DLP chipsets are available with different DMD (Digital Micromirror Device) sizes, pixel pitches, resolutions, and wavelength range, The best choice for a DLP chipset may depend on the desired object feature size, patterning speed and system form factor. Smaller DMDs offer more compact system designs while high speed.

Recommended Parts

Portability	High Resolution	High Speed
DLP3000	DLP6500FYE	DLP7000
DLP4500 DLP4500NIR	DLP6500FLQ	DLP9500
DLP5500	DLP9000	

Example applications

Factory Automation

Industrial Robotics

Medical Imaging

Dental Scanning

Industrial Metrology

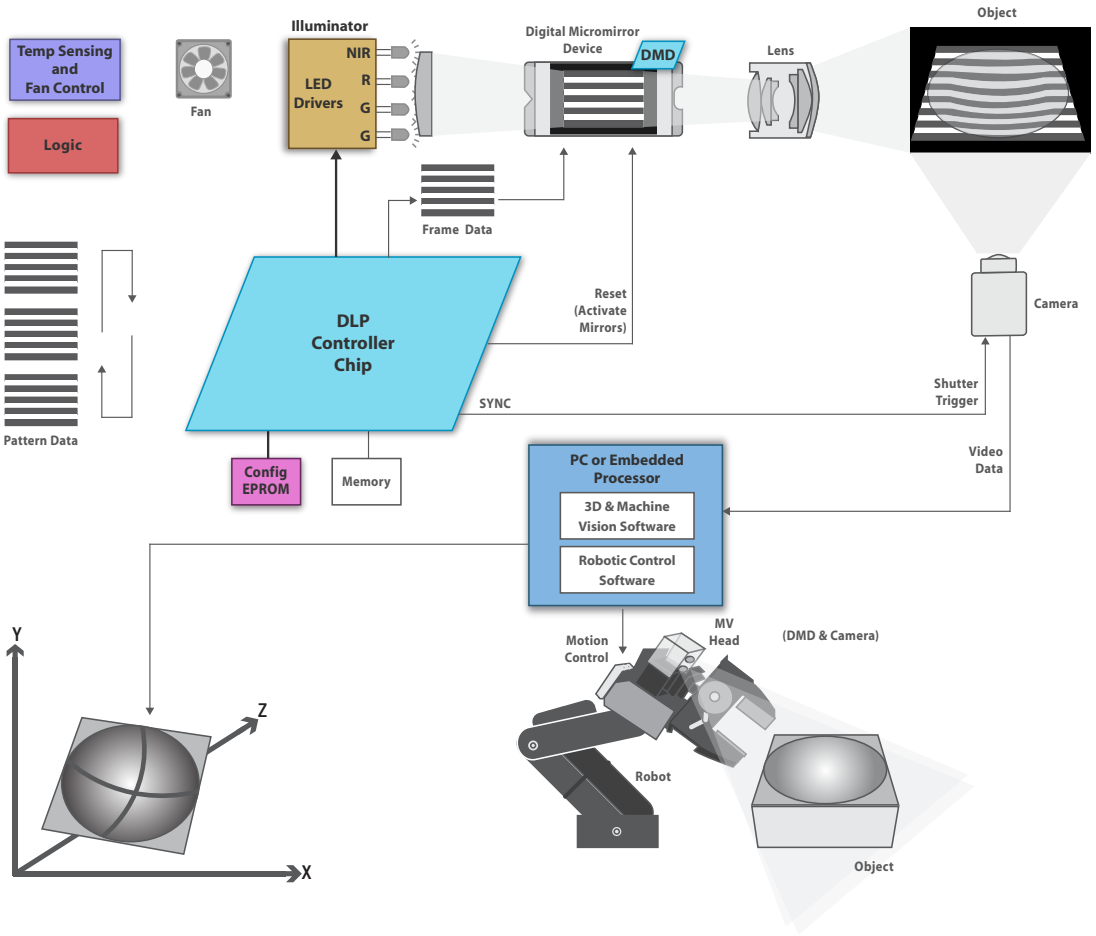
Biometrics

Evaluation Modules

Accelerate your design cycle by evaluating DLP technology with a broad selection of evaluation modules (EVMs). Our portfolio of EVMs offer a compelling combination of resolution, brightness, pattern speed, and programmability of DLP technology.

TI provides free software and firmware downloads allowing developers to easily create, store, and display high-speed pattern sequences through USB-based application programming interface (API) and easy-to-use graphical user interface (GUI).

Visit ti.com/dlp3DMachineVision for more information.



System Block Diagram

The DLP solution for 3D machine vision is shown in the diagram. DLP technology enables 3D machine vision capabilities by providing single or multiple camera 3D image capture. The system utilizes a DMD as a spatial light modulator and a DMD Controller to provide high-speed control of the micromirrors. TI LED drivers provide illumination for the DMD to project the image. From power management to embedded processors to support the system, TI's vast portfolio provides a complete system solution to create your ideal 3D machine vision design.

TIDesigns

Accurate point cloud generation

To enable customers to get to market faster, Texas Instruments also provides a TI Design for 3D machine vision applications. A TI Design is a comprehensive reference design that includes schematics, block diagrams, bill of materials, design files, software, and test reports. The 3D machine vision reference design encompasses Texas Instruments DLP structured light Software Development Kit (SDK). This design empowers developers with a framework to construct accurate 3D point clouds quickly by integrating TI's DMD in structured light solutions with cameras, sensors, motors or other peripherals. Get started at **ti.com/tool/TIDA-00254**

DLP chipsets for 3D machine vision

DMD Number	Micromirror Array	Array Diagonal	Controller	Micromirror Driver	Max Pattern Rate	Optimized Wavelengths	Pixel Pitch	Pixel Orientation	EVM	DMD Package Dimensions (lxwxh)	DMD 100u Price ($ U.S.)	Controller 100u Price ($U.S.)	Micromirror Driver 100u Price ($U.S.)
DLP3000	608 x 684	0.30"	DLPC300	—	4,000 Hz (binary)	420-700 nm	7.6 µm	Diamond	LightCrafter	16.6 x 7 x 3.54 mm	95	16	—
DLP4500	912 x 1140	0.45"	DLPC350	—	4,225 Hz (binary)	420-700 nm	7.6 µm	Diamond	LightCrafter 4500	20.7 x 9.1 x 3.33 mm	143	56	—
DLP4500NIR	912 x 1140	0.45"	DLPC350	—	4,225 Hz (binary)	700 - 2500 nm	7.6 µm	Diamond	NIRscan	20.7 x 9.1 x 3.33 mm	315	56	—
DLP5500	1024 x 768	0.55"	DLPC200	DLPA200	5,000 Hz (binary)	420-700 nm	10.8 µm	Orthogonal	—	32.2 x 22.3 x 3.66 mm	403	140	12.36
DLP6500FYE	1920 x 1080	0.65"	DLPC900	—	9,500 Hz (binary)	420-700 nm	7.6 µm	Orthogonal	LightCrafter 6500	32 x 32 mm	588	160	—
DLP6500FLQ	1920 x 1080	0.65"	DLPC900	—	9,500 Hz (binary)	400-700 nm	7.6 µm	Orthogonal	—	32 x 41 mm	1,137	160	—
DLP7000	1024 x 768	0.7"	DLPC410	DLPA200	32,552 Hz (binary)	400-700 nm	13.6 µm	Orthogonal	Discovery™ 4100	40.64 x 31.75 x 6.01 mm	787	193	12.36
DLP9000	2560 x 1600	0.9"	DLPC900	—	9,500 Hz (binary)	400-700 nm	7.6 µm	Orthogonal	LightCrafter 9000	42.2 x 42.2 x 7 mm	2,783	160	—
DLP9500	1920 x 1080	0.95"	DLPC410	DLPA200	23,148 Hz (binary)	400-700 nm	10.8 µm	Orthogonal	Discovery 4100	42.2 x 42.2 x 7 mm	2,446	193	12.36

Visit ti.com/dlp3DMachineVision for more information.

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