PrimeSense

The PrimeSensor™ Reference Design 1.08

NATURAL INTERACTION™

The PrimeSensor is an end-to-end solution that enables a computer to perceive the world in three-dimensions and to translate these perceptions into a synchronized image, in the same way that humans do. The solution includes a sensor component, which observes the scene (users and their surroundings), and a perception component, or *brain*, which comprehends the user interaction within these surroundings.

The PrimeSensor sees and tracks user movements within the scene and supplies the application layer with control widgets – thereby providing a simple clear API that translates user gestures or postures into known deterministic application inputs. All activity is performed without any assumptions about the host, the user or the environment. No wearable equipment is required, making the solution practical, convenient, intuitive and easy to use. The sensor provides a natural interface to living-room devices (such as game consoles and set top boxes), mobile devices and many more.

METHOD OF OPERATION

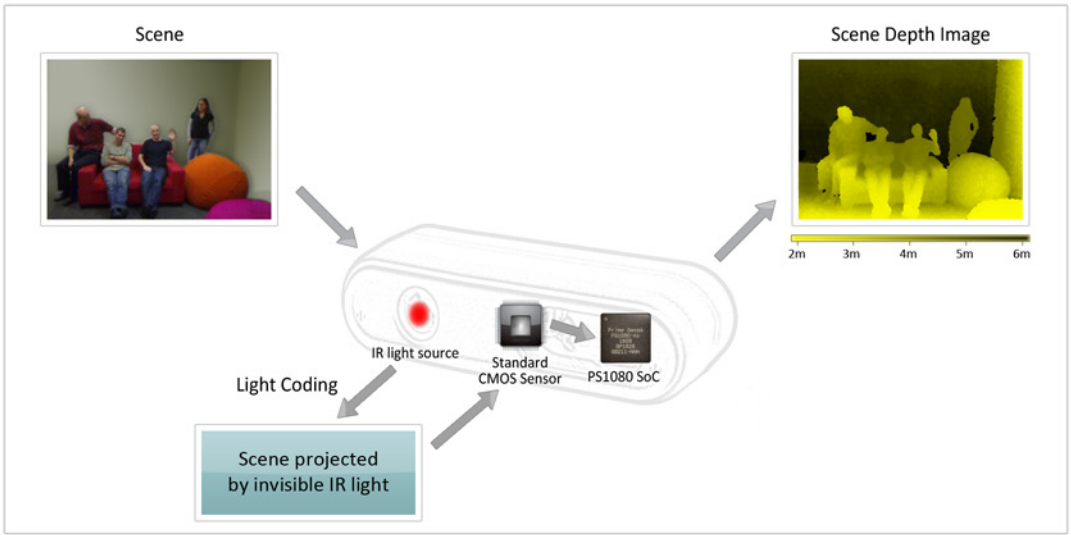
PrimeSense technology for acquiring the depth image is based on Light Coding™. Light Coding works by coding the scene volume with near-IR light. The IR Light Coding is invisible to the human eye. The solution then utilizes a standard off-the-shelf CMOS image sensor to read the coded light back from the scene. PrimeSense's SoC chip is connected to the CMOS image sensor, and executes a sophisticated parallel computational algorithm to decipher the received light coding and produce a depth image of the scene. The solution is immune to ambient light.

KEY BENEFITS

- Thin host natural interface
- Mass consumer market product price point
- Mass production proven solution
- Simple and clean application layer APIs
- Support a unique end-to-end solution – no need for the application layer to have depth processing capabilities

HIGHLIGHTS

- A large VGA-sized depth image
- Multiple sensing capabilities: depth image, color (RGB) image and audio stream
- Standard off-the-shelf components
- A unique *Registration* mechanism matches every depth image pixel to its true color image pixel
- A low-power embedded device – USB powered
- IEC 60825-1 Class 1 laser product



Founded in 2005, PrimeSense is an established fabless semiconductor startup company, and a clear leader in the field of sensory inputs for the high-volume consumer market. PrimeSense has achieved a series of patented technological breakthroughs in the field of three-dimensional machine vision that provide consumer devices with realtime, per-frame full-motion three-dimensional capturing and processing abilities. PrimeSense is the only provider of such capabilities at mass consumer market prices, and the sole provider of a holistic end-to-end sensor input solution.

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TECHNICAL OVERVIEW

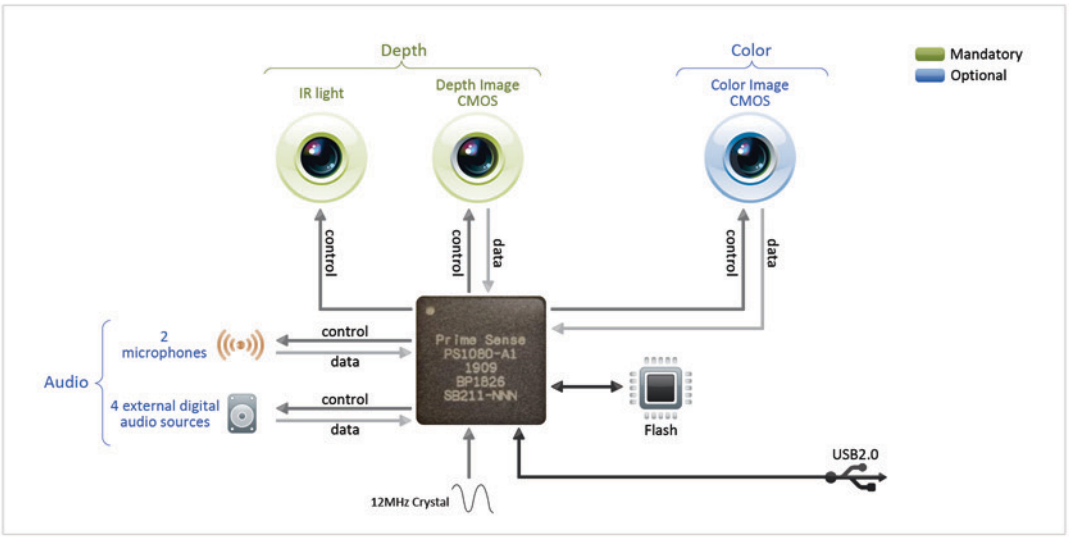
The PrimeSensor is built around PrimeSense's PS1080 SoC. The PS1080 controls the IR light source in order to project the scene with an IR Light Coding image. The IR projector is a Class 1 safe light source, and is compliant with the IEC 60825-1 standard. A standard CMOS image sensor, receives the projected IR light and transfers the IR Light Coding image to the PS1080. The PS1080 processes the IR image and produces an accurate per-frame depth image of the scene.

The PrimeSensor includes two optional sensory input capabilities: color (RGB) image and audio (the PrimeSensor has two microphones and an interface to four external digital audio sources).

To produce more accurate sensory information, the PrimeSensor performs a process called *Registration*. The Registration process's resulting images are pixel-aligned,which means that every pixel in the color image is aligned to a pixel in the depth image.

All sensory information (depth image, color image and audio) is transferred to the host via a USB2.0 interface, with complete timing alignment.

BLOCK DIAGRAM



PRODUCT SPECIFICATION

Property	PrimeSensor Spec
Field of View (Horizontal, Vertical, Diagonal)	58° H, 40° V, 70° D
Depth image size	VGA (640x480)
Spatial x/y resolution (@2m distance from sensor)	3mm
Depth z resolution (@2m distance from sensor)	1cm
Maximal image throughput (frame rate)	60fps
Average image latency in full VGA resolution	40msec
Operation range	0.8m - 3.5m

Property	PrimeSensor Spec
Color image size	UXGA (1600x1200)
Audio: built-in microphones	2 mics
Audio: digital inputs	4 inputs
Data interface	USB 2.0
Power supply	USB 2.0
Power consumption	2.25W
Dimensions (Width x Height x Depth)	14cm x 3.5cm x 5cm
Operation environment (every lighting condition)	indoor
Operating temperature	0°C - 40°C

DELIVERABLES

- Reference Design 1.08 Evaluation Kit:
  - PrimeSensor
  - Gesture API demo
  - Application demo (media center, casual games, web browsing, text entry)
- Reference Design 1.08:
  - Schematics
  - Full BOM list
  - Datasheets
  - PCB layout
  - Mechanical design
  - Acquisition firmware (PS1080 firmware)
  - Host driver
  - Device Development Kit (DDK)
- Manufacturing:
  - Reference Design knowledge transfer from PrimeSense to customer, enabling customer to build own sensor, or
  - Customer engages with PrimeSense's ODM procuring assembled units
- World-class support
  - Hardware and software support teams
  - Close support during hardware and software design and bring-up phases
  - On-site training

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