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AUGMENTED REALITY & VIRTUAL REALITY MARKET (2013 – 2018)

By Technology Types, Sensors (Accelerometer, Gyroscope, Haptics)**, Components** (Camera, Controller, Gloves, HMD)**, Applications** (Automotive, Education, Medical, Gaming, Military)**, & Geography**

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MarketsandMarkets covers thirteen industry verticals, including advanced materials, automotive and transportation, banking and financial services, biotechnology, chemicals, consumer goods, energy and power, food and beverages, industrial automation, medical devices, pharmaceuticals, semiconductor and electronics, and telecommunications and IT.

1 INTRODUCTION

1.1 KEY TAKE-AWAYS

- Global augmented reality and virtual reality market statistics with detailed classifications and splits by revenue and volume.
- Analysis of the global AR and VR market with a special focus on high growth technologies in each type of application and fast growing market segments.
- Analysis of market dynamics with factors which is currently driving and restraining the growth of the market, along with their impact in the short, medium, and long term landscapes.
- Porter's analysis in detail, market life cycle analysis along with technology & market roadmaps, evolution & time-lines.
- Illustrative and detailed segmentation of the AR and VR market by components and technology.
- Segmentation, analysis, and forecast of the major geographical markets to give an overall view of the AR and VR market.
- The future of each type of technology & industry from both - technical and market-oriented perspectives with techno-market oriented roadmaps.
- Detailed pricing & cost analysis of each type of AR and VR technology, along with future scenarios in prices and dynamics of changes in prices.
- Detailed competitive landscape with identification of the key players in each type of product market, in-depth market share analysis with individual revenue, market shares, and market share rankings.
- Competitive intelligence from the company profiles, key player strategies, game-changing developments such as product launches and acquisitions.
- Complete value chain, allied industry segments & value chain analysis of the global AR and VR industry and their impacts on the market.

1.2 REPORT DESCRIPTION

The augmented reality (AR) and virtual reality (VR) is experiencing heavy penetration in the training and infotainment market. The major reason behind heavy penetration is the wide spectrum of application areas for these technologies. Early in 1960's virtual reality based machines started to be patented and were considered as the beginning of virtual reality. Virtual reality is the three dimensional interactive world produced by a computer. The term "augmented reality" was introduced as a variation of virtual reality; it is a form of technology used to enhance real time object by imposing virtual image over it. Augmented reality application was first used for the development of virtual advertisement on television then it expanded its applications in gaming and entertainment.

Augmented reality is still under progressive stage and focuses on wearable technology like goggles, contact lens and so on which will be commonly used in future. Many research and development are taking place in application areas like healthcare, education, military, enterprise, and so on. The increase of demand in virtual reality application in healthcare industry shows a tremendous growth and it act as a major driver for the market. The market growth has resulted in exponential increase in the number of companies operating in the AR/VR domain. The companies which provide virtual reality and augmented reality tools to the developers are reinforcing their position due to the increase in the competition.

The total market is also segmented according to various technologies, components, application and, geography. The report includes quantitative data analysis for various technologies used in virtual reality and augmented reality. The types of virtual reality used are immersive VR, non immersive VR, projected VR and CAVE (Chicago automatic virtual environment). The technology used in augmented reality are marker based AR and mark-less based AR. The components used in virtual reality system are tracker, sensor, auditory interface, haptic interface, and 2D & 3D simulation software. Tracking system, sensor and a display are the components used in augmented reality system. The virtual reality and augmented reality offers good opportunities in application areas like healthcare, education, military, enterprise and so on. The report includes segmentation and analysis of the market by types, components and, application which gives an in-depth understanding of emerging AR and VR market.

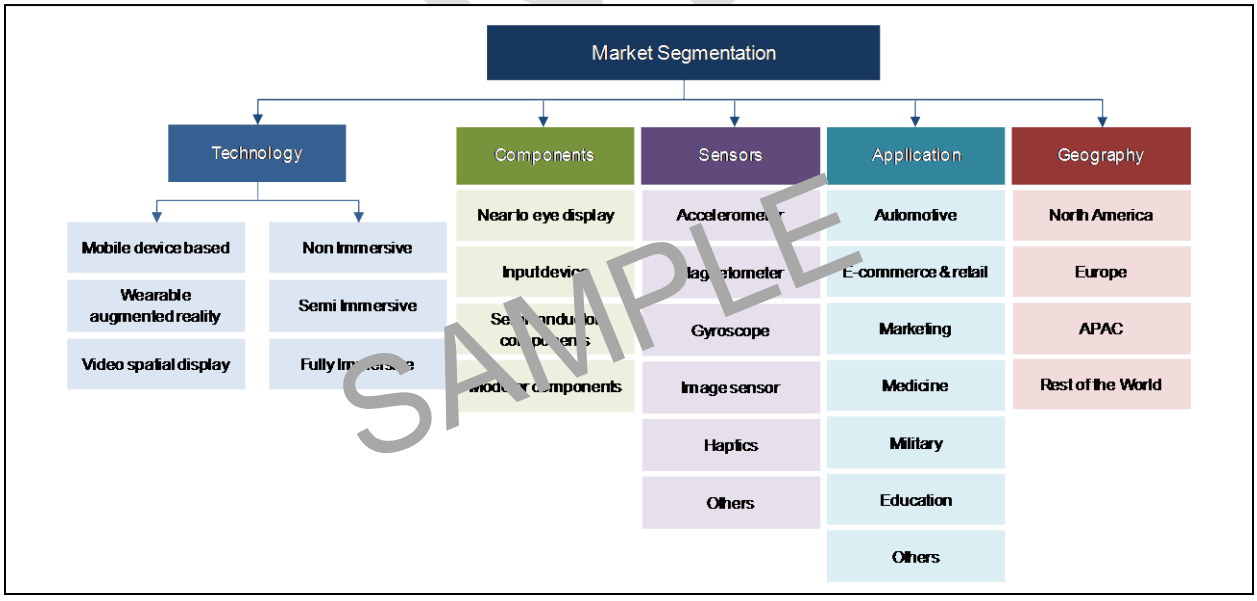
In addition to quantitative analysis, the report also includes: value chain analysis, porter five force analysis of augmented & virtual reality market, and price trend analysis. Market leaders such as: Total Immersion(France) , Eon Reality Inc. (U.S.), Qualcomm Inc(U.S.) , Metaio GmbH (Germany), Virtalis Ltd. (U.K.) and, Layar (The Netherlands) are few of the companies profiled in the report. Company profiles chapter analyze a company's strategy to grow in the market, new products launches taking place, acquisition & merger news, and partnerships and contracts signed from 2008 onwards

1.3 MARKETS COVERED

The entire report is broadly divided in to augmented reality and virtual reality market segments. The market data point for each of the segment is categorized under the following verticals: technology, sensors & components, applications, and geography. The figure below gives an overview of the macro and micro markets covered in the report.

FIGURE 1

AR AND VR MARKET SEGMENTATION, 2013



Source: MarketsandMarkets Analysis

As shown in the figure, each of the vertical is further segmented in to various micro markets.

By technology:

The technology segment is divided by AR and VR technologies. For augmented reality, it is classified in to three types: mobile device based, wearable type, and video spatial display type of technology is covered. On the other hand, for the virtual reality, the segmentation is done based on the level of immersion. The virtual reality technology is classified into three types: non immersive, semi immersive and fully immersive micro segments are covered in the report.

By components and sensors:

The component and sensor market for AR and VR are also covered in the report. Components such as: displays, gloves, head gears, processors, engines, and so on are taken in to account. Sensors are required at the input side of the system. They are usually used to detect the position, location, and orientation of user. Thus, mostly position related sensors such as accelerometer, gyroscope, and magnetometer are used. Image sensor is also required to capture the real world in the device.

By application:

The application chapter includes various applications such as: automotive, e-commerce and retail, marketing, medical, military & defense, and education. Among the mentioned applications, e-commerce and military are the one's seeing maximum penetration currently. However, other applications are expected to emerge rapidly by the year 2015.

By Geography:

The global report is split by four major regions. It includes North America, Europe, APAC, and ROW. The split gives an insight about the regional untapped potential and preference.

1.4 STAKEHOLDERS

- Semiconductor Component Vendors
- Content developers
- Advertising agencies
- Mobile/Portable device manufacturers
- Distributors and Retailers
- Research organizations
- Universities
- Technology Standards Organizations, Forums, Alliances and Associations

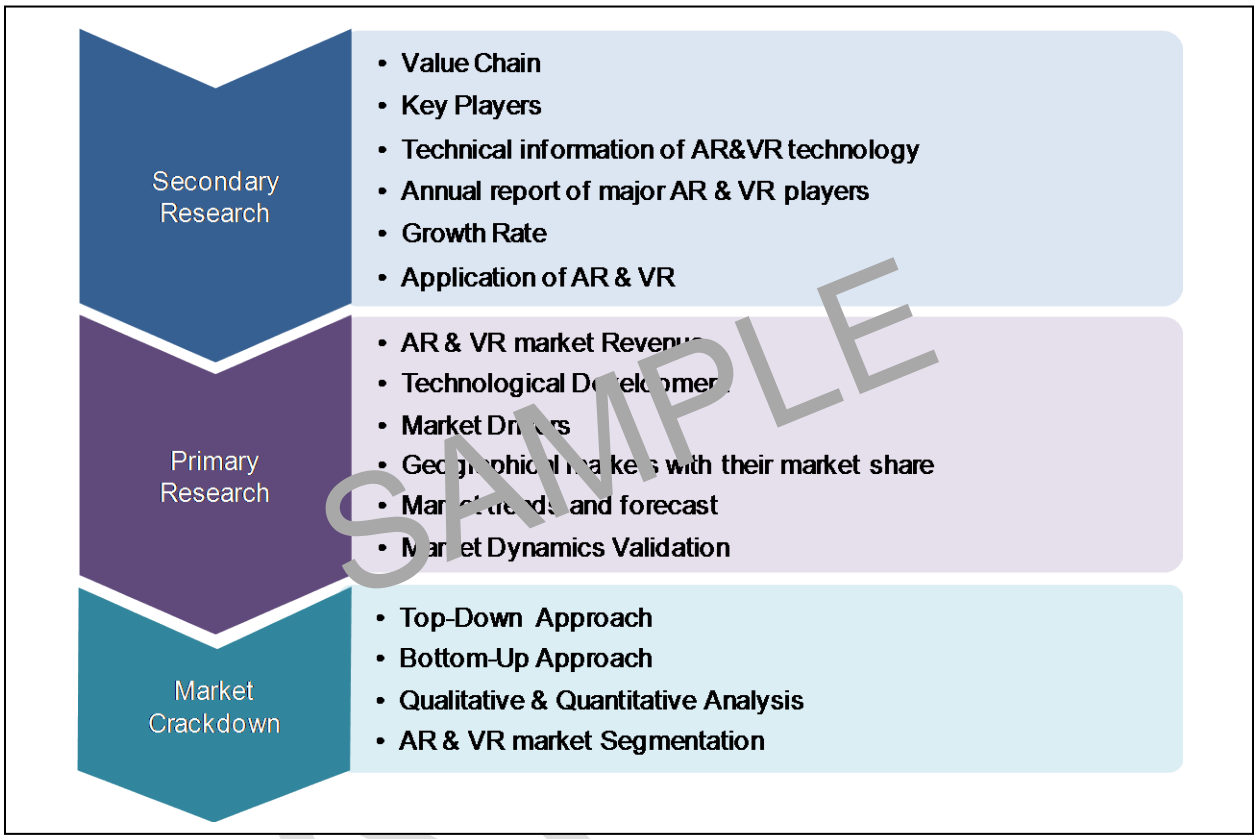
1.5 RESEARCH METHODOLOGY

This research study involves the usage of extensive secondary sources: directories, and databases such as Hoovers, Bloomberg, Business-week, Factiva, One-Source, and so on to identify and collect information which is useful for this extensive technical, market-oriented, and commercial study of this global market. The primary sources are mainly industry experts from core and related industries and preferred suppliers, manufacturers, distributors, administrators, solution providers, technology developers, alliances, standards & certification organizations from companies, organizations related to all the segments of this industry's value chain. All the primary sources were interviewed to obtain and verify critical qualitative & quantitative information as well as assess the future prospects.

The below figure shows the market research methodology applied in making the report on the global AR & VR market.

FIGURE 2

MARKET RESEARCH METHODOLOGY



Source: MarketsandMarkets Analysis

1.5.1 MARKET SIZE ESTIMATION

Both - "Top-Down" and "Bottom-Up" approaches were used to estimate and validate the market size of the global market and for market size estimation of various other dependent sub-markets in the overall augmented reality and virtual reality market. The research methodology used to estimate the market size also includes the following details:

The key players in the industry and markets are identified through secondary research while formulating the industry value chain and their market revenue were determined through primary and secondary research. They include study of the annual and financial reports of the

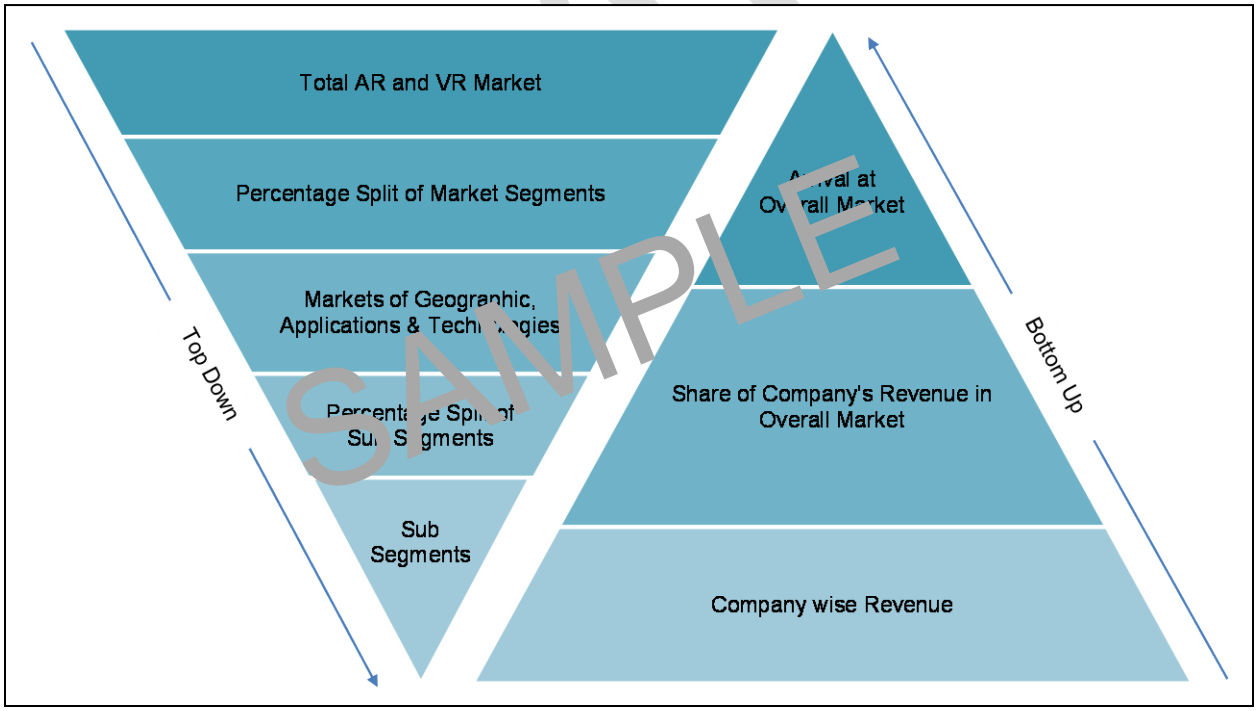
top market players and also extensive interviews of key opinions from leaders such as CEOs, Directors, and Marketing Executives.

All the percentage shares, splits, and breakdowns were determined using secondary sources and verified through primary sources. All the possible parameters that affect the markets covered in this research study have been accounted for, viewed in extensive detail, verified through primary research, and analyzed to get the final quantitative and qualitative data. This data is consolidated and added with detailed inputs and analysis from MarketsandMarkets, and presented in this report.

The below figure shows an illustrative representation of the augmented and virtual reality market size estimation process implemented in this research study in a consolidated format.

FIGURE 3

MARKET SIZE ESTIMATION



Source: MarketsandMarkets Analysis

Firstly, the Bottom-Up procedure was implemented to arrive at the overall market size of each AR and VR market from the revenue of the key players (companies), and shipments deployed.

Calculations based on the revenue and shipments of key companies identified led to overall market sizes of the markets. The overall augmented and virtual reality market size was used in the Top-Down procedure to estimate the market sizes of all the other individual markets in the market segmentation by technology, application and geography via percentage splits from secondary and primary research.

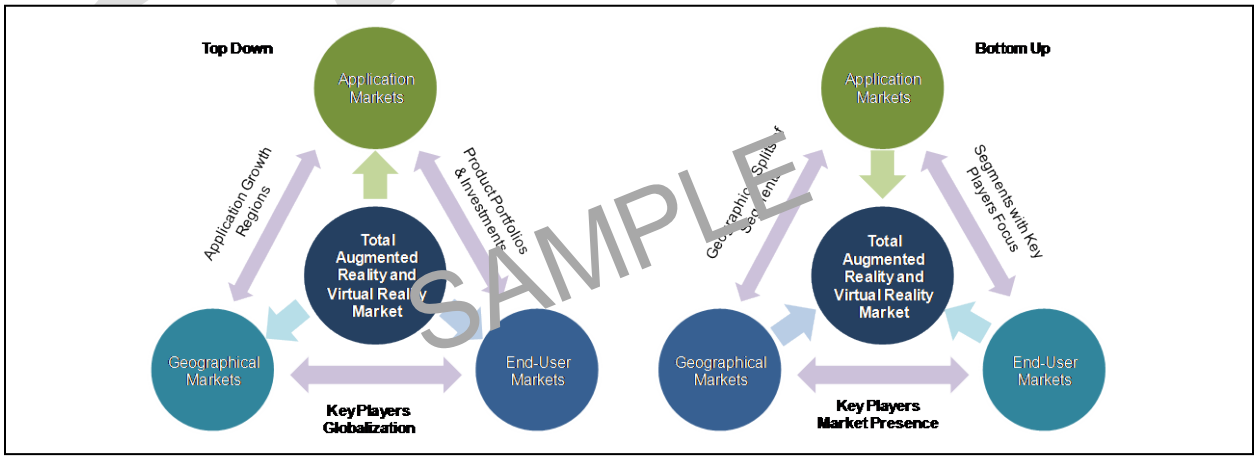
1.5.2 MARKET CRACKDOWN & DATA TRIANGULATION

After arriving at the overall market size from the market size estimation process explained above, the total market has to be split into several segments and sub-segments, by various types of classifications. In order to finish with the overall market engineering process and reach the exact statistics for all the market segments & sub-segments, data triangulation & market crackdown procedures explained below were implemented wherever applicable.

The following figure shows the market crackdown structure and the data triangulation procedure implemented in the market engineering process of making this report.

FIGURE 4

MARKET CRACKDOWN & DATA TRIANGULATION



Source: MarketsandMarkets Analysis

The figure above shows the core data triangulation procedure used in this report for every market, sub market, and sub-segment. The percentage split-up of various major market segments (by product and geography) was used to arrive at the market sizes of each AR and VR market by product and geography.

The major aspects focused on interconnecting the values when deduced from application, geography, and company revenue are illustrated through the arrows in the figure above. The exact reverse of the above-mentioned procedure, i.e., "Bottom-Up" from product and geography segments to arrive at the overall market size and "Top-Down" from overall market to arrive at the individual company (key players) revenue was also done to validate all the market sizes arrived at, in the procedure mentioned above and shown in the figure.

Besides, the other forms of data triangulation were also implemented in specialized market sizes; for example, data was triangulated from the global augmented and virtual reality market revenue – for all the applications (which is a parent market) in arriving at the overall market size of augmented and virtual reality market and similarly for all the market segments and sub-segments. Analogous to these, the market volume and average selling prices (ASPs) in each of the market segments were arrived at by similar methods and procedures. Data was also triangulated among the revenue, volume, and calculated ASPs. Thus, validation of data was done by deriving data from the several aspects of the respective market segments.

1.5.3 KEY DATA POINTS TAKEN FROM SECONDARY SOURCES

- Data for extensive and exhaustive segmentation and classification of the global AR & VR market.
- Validation and triangulation of all the numbers and graphs.
- Segmentation breakups, split-ups, and percentage shares.
- Data for market revenue and volume.
- Key industry trends of the top players of the AR and VR market.
- Qualitative insights into various aspects of the market, key trends, emerging areas.
- Quantitative data for mathematical and statistical calculations.

- Company statistics (quantitative) and developments (qualitative) for company profiles.

1.5.4 KEY DATA POINTS TAKEN FROM PRIMARY SOURCES

- Current and proposed production volumes of particular categories by market players.
- Validation of numbers for various devices shipments and revenue cycle of the markets.
- Pricing estimation and validation of the pricing along with the forecast model.
- Market shares of key industry players in the market.
- Percentage split of individual markets for geographical analysis.
- Forecast for various market segments of the overall markets and validation of the forecast data.
- Technological landscape, competition between technologies, industry preferences, market dynamics.
- Competitive landscape of the key players, market shares, market share rankings, the competition dynamics and recent industry activities.

2 EXECUTIVE SUMMARY

New technologies are evolving to make an effectual contribution to thriving segments like mobile computing, gaming, military, healthcare, and so on. Virtual reality technology was already in existence since decades and augmented reality technology emerged as a variant of virtual reality. Augmented reality technology overlaps the computed generated data and images on to the real world view and it offers a new experience to users. The use of augmented reality technology completely changes the concept and drives augmented reality technology far beyond the abilities and opportunities of different applications.

The report provides key strategic contribution on the augmented reality market with comprehensive forecasts for revenue creation across technology, hardware, and applications connected to this market. Many kinds of information available through augmented reality applications which includes commentaries, advice, physical conditions, distance, x-ray, map, diagram, and views which let the users have in thoughts and to run on to different applications. Review of the most recent business models which is being put into practice by leading augmented reality firms and analysis of existing applications are included in this report. This report has included the drivers and challenges involved in augmented and virtual reality market.

The global augmented and virtual reality market segmentation revolves around four major verticals; technology, sensors, applications and geography. Each of these is further segmented into individual sub-segments. The industry vertical segment of augmented and virtual reality covers major applications such as aerospace, designing, automobile, consumer electronics, medical, military, and education.

The global augmented and virtual reality market analyze includes the datasets for augmented and virtual reality applications systems. Nevertheless, the report gives a technology-wise comparison of global augmented and virtual reality market. Industries and research institutions are investing in augmented reality technology with substantial benefits and its potential in mind.

TABLE 1

GLOBAL AUGMENTED REALITY & VIRTUAL REALITY VOLUMES, 2011 – 2013

Technology	2011	2012	2013	2014	2015	2016	2017	2018	CAGR % (2013 – 2018)
Virtual reality system ('000 units)	XX	XX	XX	XX	XX	XX	XX	XX	XX
Dedicated augmented reality system ('000 units)	XX	XX	XX	XX	XX	XX	XX	XX	XX
Mobile devices based augmented reality (Million units)	XX	XX	XX	XX	XX	XX	XX	XX	XX

Source: MarketsandMarkets Analysis

The table above shows the volumes for the augmented and virtual reality systems. The volumes for mobile device based augmented reality system are shown separately since it includes the shipments of all augmented reality enabled smartphones and tablets. In 2012, virtual reality volumes were XX units and it is expected to grow to XX units by 2018.

Major companies in the augmented reality and virtual reality market are Total Immersion (U.S.), Qualcomm Inc. (U.S.), Metaio GmbH (Germany), Oculus VR, Inc. (U.S.), Vuzix Corporation (U.S.), and Eon Reality, Inc. (U.S.).

3 MARKET OVERVIEW

3.1 MARKET SEGMENTATION

3.1.1 AUGMENTED REALITY

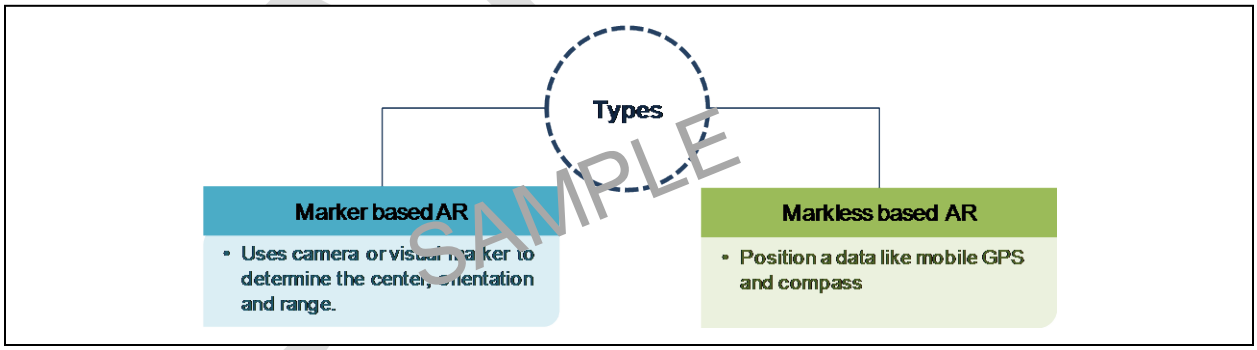
Augmented reality is a field which deals with the superimposition of real images and computer generated data. The total market for augmented reality is divided by the technique employed. There are two basic techniques; marker based and marker-less. Each of the technique is described in detail in following sections.

3.1.1.1 Types of Augmented Reality Technology

The augmented reality is classified in to two types, maker-less augmented reality and marker based augmented reality. The figure below gives an overview of the two types.

FIGURE 5

TYPES: AUGMENTED REALITY



Source: MarketsandMarkets Analysis

Marker-less augmented reality technology offers real time operations using natural feature tracing technique and does not use a marker to track the object. The marker-less augmented reality uses real object or natural features as a target. The global positioning system (GPS) and the compass are the optional components which can be used for marker-less augmented

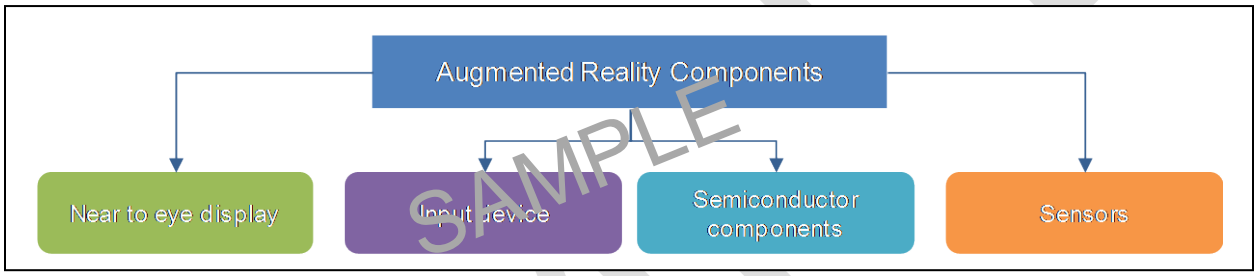
reality technology. The image or marker detected by a computer or a mobile device using image processing or by pattern recognition is known as a marker based tracking.

3.1.1.2 Components of Augmented Reality System

The major components of augmented reality system are tracking system, sensor and display. These components are indispensable for the working of augmented reality system.

FIGURE 6

COMPONENTS: AUGMENTED REALITY SYSTEM



Source: MarketsandMarkets analysis

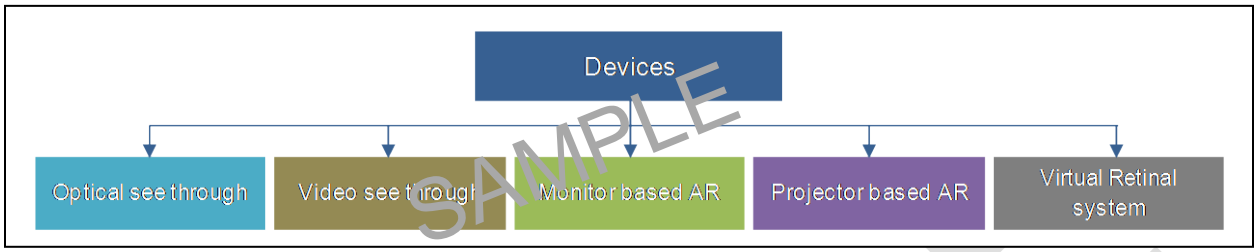
The object from the real world and the virtual world should be aligned properly; in order to track the position of the object tracking system is used in augmented reality system. A head mounted display or monitor is the most often used in augmented reality system. The position and orientation of an object is determined using a sensor.

3.1.1.3 Augmented Reality Displays

The augmented reality system is classified based on display which includes optical see through, video see through, monitor based AR, projector based AR and, virtual retinal system.

FIGURE 7

AUGMENTED REALITY DISPLAYS



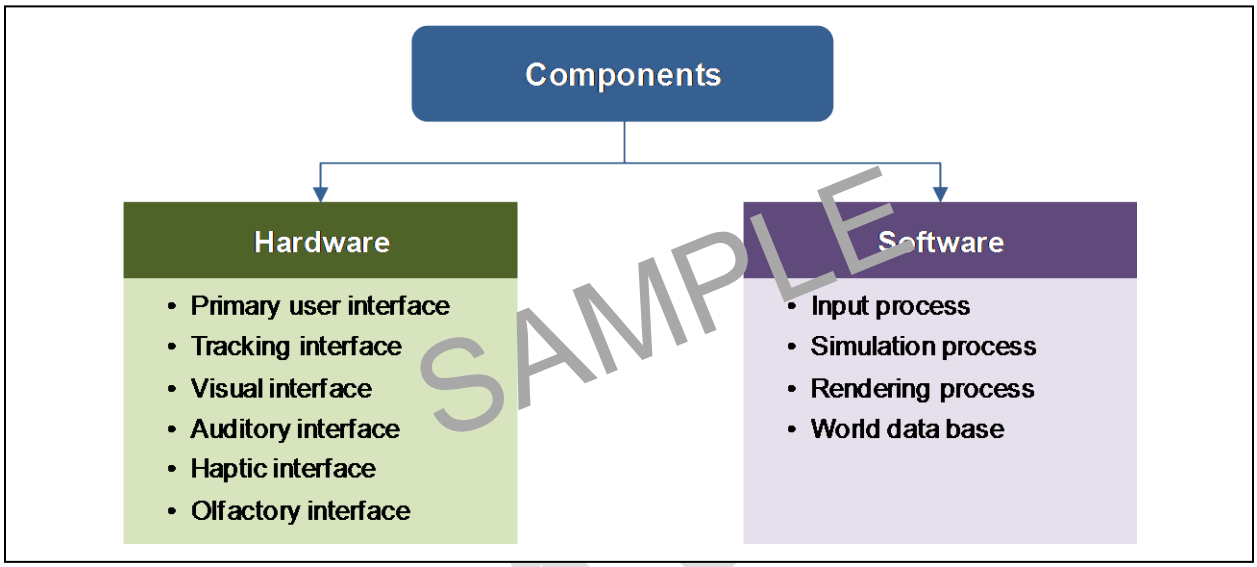
Source: MarketsandMarkets analysis.

Optical see through and video see through devices uses head mounted display to show the merged view of virtual and real images. The only disparity between both devices is optical see through use a transparent head mounted display and an opaque display in video see through. The monitor based AR used desktop or mobile display instead of a head mounted display. The real world object is used as surface for virtual objects in projector based AR. The virtual retinal system provides an augmented image with high resolution virtual display.

Augmented reality is still under progressive stages and focuses on wearable technology like goggles, contact lens etc which will be common to users in future. Further research and development are undergoing in application areas like healthcare, education, military, enterprise and so on.

FIGURE 8

COMPONENTS: VIRTUAL REALITY SYSTEMS

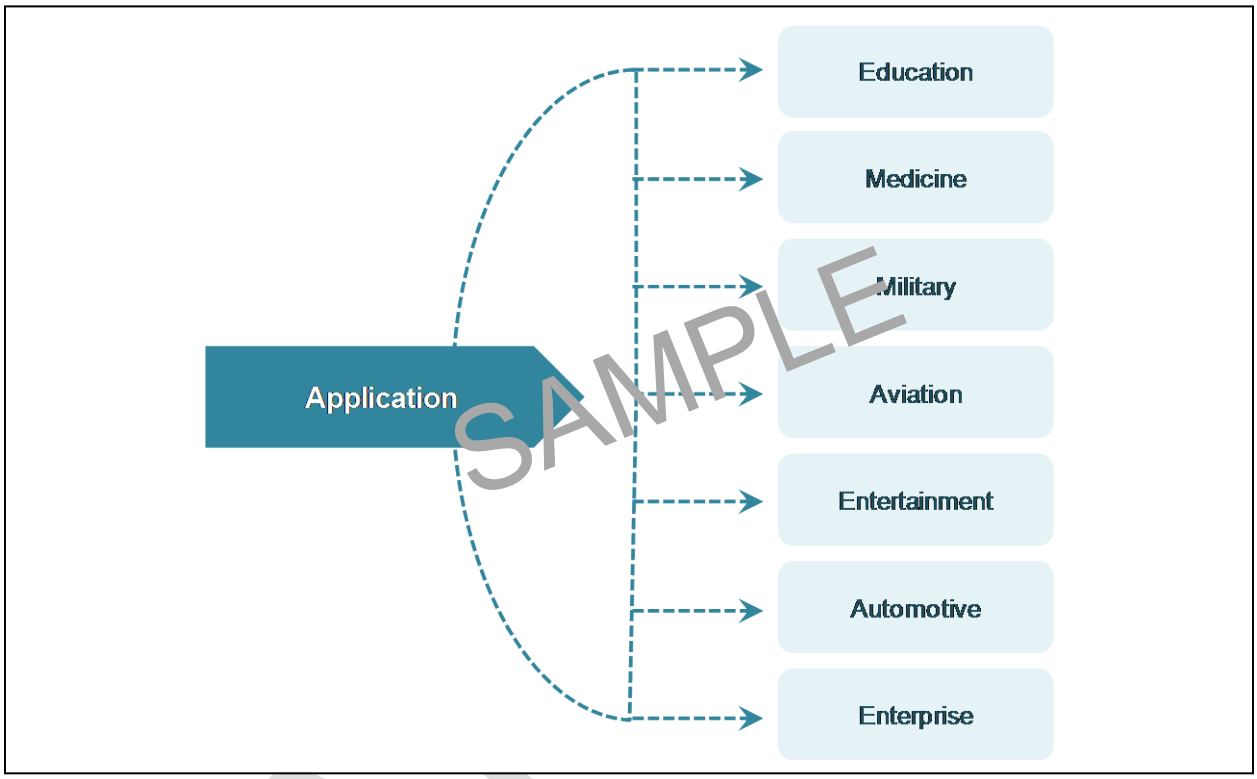


Source: MarketsandMarkets analysis

The virtual reality system consists of hardware and software. The hardware components include keyboard, mouse, and, joystick which comes under primary user interface. The tracking interface is used to track head, body, hand or eye motions. The field of view (FOV), resolution, color etc are considered in visual interface for tracking and focusing an object. The speech recognition is done in auditory interface. Haptic interface is used to provide information to the users through sense or touch. The olfactory interface includes the detection of various odors and sends the signal of smell to the receiver and reproduces it. The software is used for proper synchronization, control and for the creation of virtual environment through internet and with World Wide Web.

FIGURE 9

APPLICATIONS: VIRTUAL REALITY



Source: MarketsandMarkets analysis

The virtual reality had got the attention of lots of people and its offers great opportunities in many application areas as mentioned. The virtual reality applications are used in health care to give training to doctors and to do surgery in a risk free environment. Virtual reality applications are used in military in order to reduce hazards. The manufacturer in automotive industry use virtual reality application for the designing of a vehicle and their installation. Virtual reality system is used in aerospace and defense to enhance the development of space systems and their operation. This technology is used in aerospace to train crews and ground controllers. Virtual reality is used in enterprise application to analyze the data and for forecasting. This technology is also used for conducting meeting with clients located in different location. The virtual reality techniques are used mostly in gaming application and this technology is also used in other entertainment application areas like virtual museums, virtual parks, theatre and others.

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