From the Stone Age to the Virtual Factory - GridRaster and the Rise of Enterprise MR

Tools as a Means of Human Progress

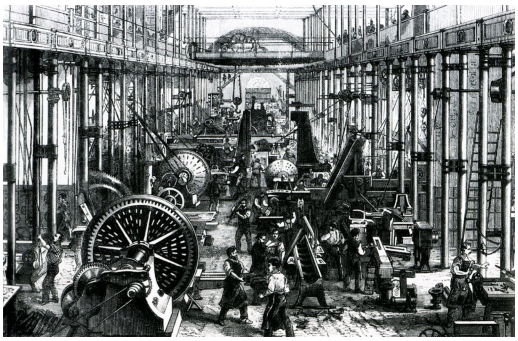
The history of human development has been intertwined with the invention of tools and systems that made it easier to do things than it was before the existence of those tools and systems. In the modern era, the process by which products were made in mass for large portions of the population changed dramatically driving up the quality of living standards across the world. These Industrial Revolutions were rooted in technological advancements whose foundations lie in the invention of those early primitive stone tools. As we settle into the Fourth Industrial Revolution, new and innovative technologies continue us on that path of evolution. And as big as a gap as it may be from that first hammerstone to complex mixed reality manufacturing processes, the throughline has always been progress by means of new technology.

The Industrial Revolutions

Some of the most dramatic changes to industrial manufacturing came during the First and Second Industrial Revolutions. The First Industrial

Revolution started in the early 1700s sparked by the invention of the steam engine by Thomas Newcomen. That revolution ushered in textile mills, the cotton gin, the mechanical reaper, the steel plow, the telegraph and the telephone. In relatively short order, the world went from laborious, hand production methods to machine-driven processes.

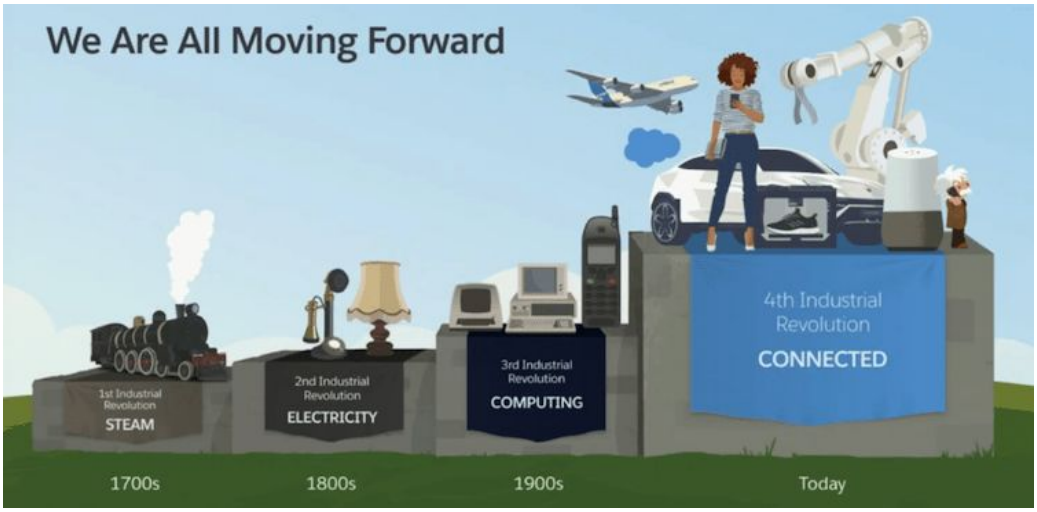
The Second Industrial Revolution began in the second half of the 1800s and was marked by the build out of the railroads, heavy factory machinery, large-scale iron and steel production and the use of petroleum and electricity. This era saw a move towards large-scale production, and better labor organization and communication. Without these advancements in technology, mass production of automobiles (among many other world-changing products) would not have been possible.



The Third Industrial Revolution started in the 1950s with the invention of semiconductors and microprocessors. This has been called The Digital Revolution and it has brought about the digitization of nearly everything in the manufacturing process. The introduction of robots and automation into the manufacturing process has vastly improved the safety of factory workers and has allowed for the shift to a more service-based economy.

Mixed Reality and The Fourth Industrial Revolution

We are now in the era of the Fourth Industrial Revolution where the lines between the physical, digital and biological are blurring, and every person and object in the manufacturing process will be intricately linked in an always-on connected world. Among other technologies, Mixed Reality--the merging of real and virtual worlds to produce new environments and visualizations where physical and digital objects co-exist and interact in real time--will be a major factor in the development of the Fourth Industrial Revolution. It provides enormous opportunities across the product life cycle to greatly improve the way we visualize concepts, manipulate and collaborate on product design, service and maintenance.



GridRaster - Mixed Reality for Enterprise

All of this is why we at MaC Venture Capital are excited to announce today that we have led the series seed round of GridRaster, a new cloud platform for enterprise mixed reality (MR), investing alongside some truly great investors that include Exfinity Venture Partners and Blackhorn Ventures, and existing investors Unshackled Ventures.

GridRaster is focused on providing software infrastructure for immersive MR on wearable and mobile devices for industrial applications. The company provides some of the key foundational building blocks for enterprise MR by leveraging the cloud and 3D AI that aid in several aspects of enterprise operations including design and engineering, operations and manufacturing, training and remote assistance, and customer experience.

Design & Engineering	Operations & Manufacturing	Training & Remote Assist	Customer Experience
Augmented Interface	Failure Predictions & Preventative Maintenance	"Know What I Know"	Higher win rates
Collaborative Design Review	Operator & Assembly Work Instructions	Remote Expert Assist.	Shorter sales cycles
Quick Iterations	Better Planning	Reduced Cognitive Load	Augmented Brand Experience

Currently AR and VR head-mounted displays (HMDs) are small (and getting smaller) and have limited computing and battery power. The devices can become hot due to heavy processing strain on their cores and have capped CPU and GPU performance. Additionally, sending data off the HMD to the cloud and back can cause issues when time precision is key.

The winners in the enterprise MR space are winning contracts now and building up solid working relationships with big and smaller companies alike, and GridRaster has later-stage pilots with several top aerospace, automotive and telecommunication companies. The pioneering team at GridRaster, Rishi Ranjan, Bhaskar Banerjee, Dijam Panigrahi and Venkat Dass have a lengthy history of working together. They have shaped some of the defining technologies such as 3G/4G/VOIP/Optical, having previously worked at Qualcomm, Apple, Broadcom and Texas Instruments. And they are using their deep expertise in computer graphics, cloud computing, AI, wireless infrastructure, optical, mobile and software development to shape the future of the next defining computing platform.

Rishi Ranjan
CEO & Founder

Dijam Panigrahi
Co-founder

Yaranama Venkat R Dass
Co-founder

Bhaskar Banerjee
CTO

Timing the MR Enterprise Market

There have been several big developments that gave us confidence that now was the time to be investing in the enterprise AR market.

- **Head Mounted Display (HMD) Development**: Several of the major HMD manufacturers have announced or released enterprise-level headsets that are being tested and used in some of the top Fortune 500 manufacturing companies. While not a comprehensive list, below are some of the bigger players in the space.
    - Microsoft HoloLens 2 -- released February 2019
    - VIVE Pro and VIVE Enterprise -- Vive has been selling their "business additions" since 2016
    - Oculus Rift S -- released March 2019
    - Magic Leap One -- released August 2018
    - Epson MOVERIO -- Epson has been selling since 2016
    - Lenovo ThinkReality A6 -- released May 2019
    - Mira Smartphone-powered Headset -- started enterprise testing in 2018
- **5G Deployment**: Much has been said about 5G rollout, but in 2019 we started seeing commercial deployments by the major telcos across the country. 5G will help solve latency issues in high-end enterprise MR.
- **Advanced Graphics and Game Engines**: In enterprise MR, the real world (including machine parts, assembly lines, factories, assembled and disassembled products and even people) must be recreated virtually in great graphical details. Game engines like Unity and the Unreal Engine are being utilized to help in these real-world recreations.
- **Advancements in Occlusion**: Occlusion in AR means hiding virtual objects behind real-world objects. If one virtual engine part is behind a physical panel you should not be able to see the virtual object until you open the panel. This is a complex process and companies like Niantic and 6D.ai have made great strides in this area.
- **AI Based Object Identification**: Real-world objects, parts, people, tools, etc need to be identifiable in real time by MR systems. As companies ingest large databases of product information these systems are getting smarter and more efficient in object recognition.
- **Dedicated MR Executives and Budgets**: We have seen many organizations create Emerging Technology Leads or MR specialists and those executives and their teams have meaningful and growing budgets dedicated to the testing and deployment of MR systems into their development, manufacturing and training processes.
- **Walmart Goes All-In On VR**: The world's biggest retailer has gone all-in on VR with more than 1 million Walmart associates, across every store in the U.S having access to cutting-edge VR training in partnership with companies like Strivr.
- **Rise of Distributed Workplace and Teams**: Globalization and multinational corporations has given way to distributed teams dispersed around the globe. One specialist may be in Tel Aviv while another is in Hong Kong. The need to have them work synchronously is growing and MR processes can facilitate this.

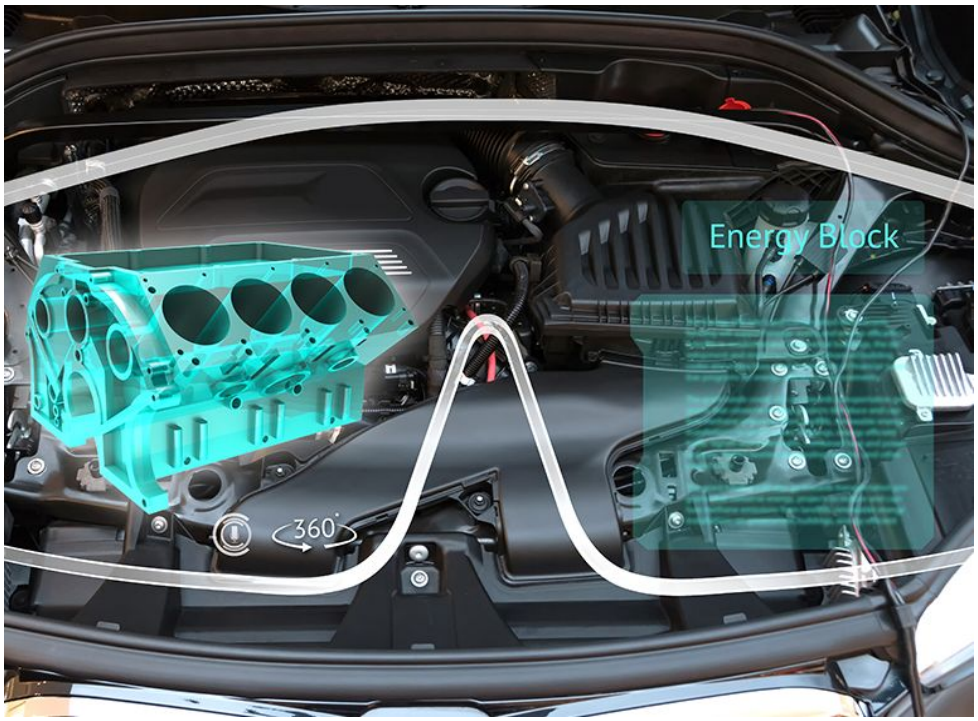
And as mentioned above, enterprises in several industries--notably aerospace, automotive and telecommunication--have started to commit real resources dedicated to deploying MR in their

manufacturing processes. Major adoption hurdles of 1) realistic visuals (resolution, frame rates and latency), 2) scene understanding (contextual intelligence, 3D reconstruction and AI-based object identification), and 3) precision (positional alignment, stable anchoring and occlusion) are all being addressed by GridRaster, driving meaningful market growth.

The use of MR in the manufacturing process allow for efficiency improvements never before possible:

- Aerospace technicians use AR instructions for airplane wiring schematics in their field of view, allowing them to be hands-free.
- Automotive assembly workers use VR to capture human movement during equipment assembly through motion sensors to re-engineer movement to decrease the risk of injury and increase productivity.
- The development and testing of satellite production can be done across large distributed teams virtually in real-time with millimeter-level precision reducing delays and costly errors.
- Fieldworkers at municipal utilities use AR and VR glasses to see concealed utility lines under the streets in real-time.
- Car dealerships use AR and VR to instantly customize virtual cars and better showcase internal features to drive a more complete and effective sales experience.

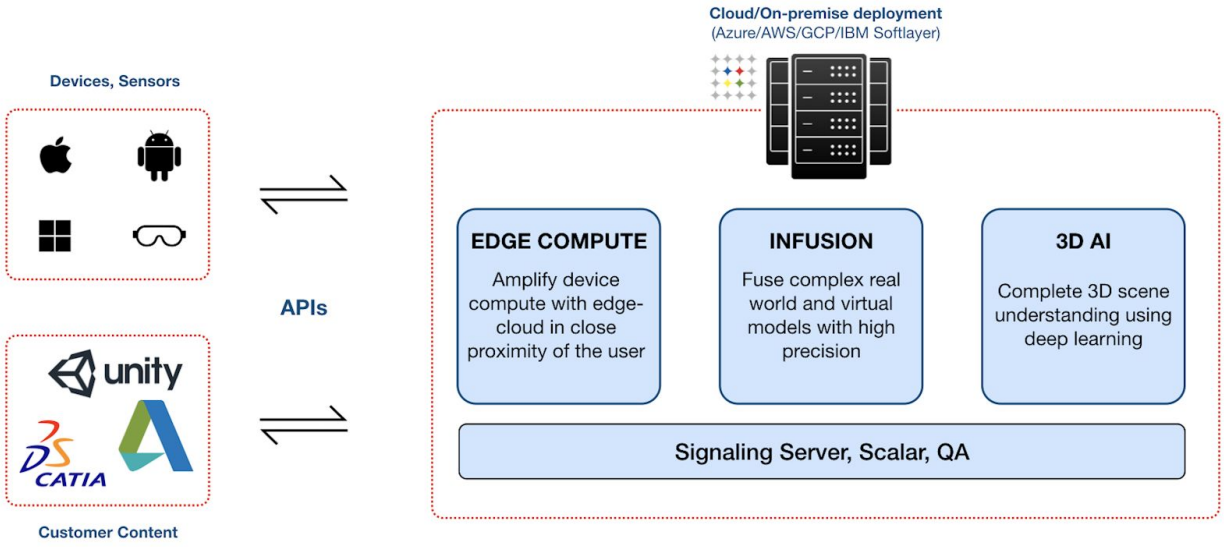
The Difference in GridRaster



GridRaster's software technology focus helps further advance MR experiences by off-loading processing to remote servers and clouds to support real-time collaboration of complex 3D models with significantly reduced power requirements on mobile devices. They are HMD agnostic and work across multiple content engines. GridRaster's Mixed Reality cloud platform provides the performance and scalability to drive innovation in the industry at speed and scale.

The key features offered by GridRaster are as follows:

- Low latency, high frame rate visual rendering from servers on-premise (for sensitive data), and/or on low latency cloud. High-fidelity graphics at 10x the performance compared to standalone mobile platforms — a feat accomplished by edge computing.
- 3D-vision based AI for accurate scene understanding, precise infusion of large and complex virtual objects onto the real world, and low-latency high-fidelity visual rendering.
- High resolution spatial mapping to capture large point clouds and 3D reconstruction of the large real-world scenes.
- Underlying infrastructure to distribute and manage loads across servers, dynamically optimizing network bandwidth and intelligently reducing latency to enable compelling immersive experiences offering high-fidelity graphics at ultra-low latency with a 10x increase in performance over the mobile platforms alone, and easy integration into popular engines like Unity.
- Highly scalable and robust distributed architecture that scales seamless with number of users or number of geographical locations or size of the content.
- API-based approach which enables a seamless integration with existing content formats, provides cross-platform support and enables easy and rapid deployment.



Embarking on a New Era in Manufacturing

We are in the very early years of The Fourth Industrial Revolution where experimentation and pilots are more common than mass deployments of new technology. However, just as when interchangeable parts and the assembly line were introduced into the world of manufacturing, once these new systems are discovered, tested and integrated there will be no turning back. And If history has taught us anything it is that technology and progress cannot be stopped. It is exciting to bear witness to the birth and evolution of the next era in manufacturing and we are

proud to be supporting the team at GridRaster who are playing an important part in this new phase of history.

About MaC Venture Capital

MaC Venture Capital is the result of the merger between successful Los Angeles and Bay Area based Seed funds, Cross Culture Ventures and M Ventures. MaC Venture Capital is an early stage venture capital firm focused on finding ideas, technology, and products that can become infectious. We invest in technology companies that benefit from shifts in cultural trends and behaviors in an increasingly diverse global marketplace.