

What would you build if you had this kit? *

150 words or less.

I would build prototype systems for an augmented-reality driver assistance platform with the Arduino Development Kit. Micro-scale sensors would track vehicle speed, lane drift, and distance to nearby objects, with the eventual goal of displaying this vital information on a heads-up-display (HUD) on a transparent eyewear piece or windshield display. For this prototype, the information would likely be displayed on a standard LCD screen instead, as transparent displays have low availability and high cost, requiring the larger budget and more development time. Realistic data recordings taken in a moving vehicle should be presented in January. I would also develop and benchmark power-saving techniques, similar to current hot topics in embedded systems research. Finally, I would demonstrate feasibility of object recognition techniques via machine learning on a PC (not using the Arduino kit), with the end goal of incorporating resource-constrained image processing in the \$1000 system.

What problem are you solving? *

150 words or less

Drivers face many distractions and are required to keep track of many things while operating motor vehicles. They also vary wildly in fatigue level, observation skills, memory, and many other factors, which can lead to overstimulation, distraction, and other types of mental lapses. This project aims to synthesize the most important information, such as vehicle speed, lane departures, blind spot occupation, and road sign information, and display them in the driver's peripheral vision via a HUD on a transparent eyewear display. Keeping this critical information in the driver's sight would reduce time spent on visual search (such as checking the speedometer and blind spots), and prevent forgetfulness regarding the driver's most attention-demanding tasks. Although some similar features exist on premium vehicles, an aftermarket solution such as this project would open up these technologies to a wider audience. Additionally, low-power techniques and embedded systems-scale machine learning could further current research topics.

What venture could you develop from this? *

150 words or less

This project would present several distinct opportunities. First, augmented-reality is an under-developed field waiting for breakthroughs, and a cost-effective, reliable base platform could become a major market player. Although this project has a specific application, the augmented-reality portion could be repurposed for general-use development, and marketed to other developers, or used to secure contracts to develop other applications. Second, it could be used to create competition with automakers for advanced driver safety features, since having a standalone gadget that is compatible with any vehicle may be an attractive draw to tech enthusiast customers. Third, effective, resource-constrained machine learning and image processing techniques could be attractive products on their own. Their applications in embedded systems are not currently as well-explored as other topics, due to the work required to scale them down and retain reliability.

What would you do if you had an additional \$1000? *

150 words or less

First, the transparent display development would be fully developed, including an eyewear mounting, or alternatively, a windshield mounting. If this becomes unrealistic, development would be shifted to a traditional display mounted on the dashboard, possibly also utilizing status LEDs and audio feedback. Second, the Arduino would be replaced with custom printed circuit boards for optimized cost and power consumption. Third, a camera/image processing module would be developed, likely with a separate, more powerful processor. This would be used in conjunction with further machine learning algorithm development to complete object recognition-type tasks, such as more reliable lane departure detection and blind spot monitoring, potential hazard detection, and the collection of road sign information, such as highway exits and speed limits.