**2022年英特尔杯大学生电子设计竞赛嵌入式系统专题邀请赛**

**参赛队作品简介**

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| **作品题目**  **（中英文对照）** | | “夜鹰”——暗光增强全彩成像  "NIGHTHAWK" -- ENHANCED FULL-COLOR IMAGING IN LOW ILLUMINATION ENVIRONMENT | | |
| **作品**  **简介**  **（中**  **英文**  **对照**  **，中**  **文限**  **500字以**  **内）** | 在缺乏辅助方法的低照度条件下，人类感知世界的能力和光学成像设备的成像质量均表现出不同程度的下降，得到的图像一般会有整体偏暗、对比度差、以及细节不明显等问题，从而影响人们对图像内容的观察和后续使用，也造成了低照度下的犯罪打击、环境保护、区域安防等诸多领域面临的难题。  本项目结合计算机视觉技术和深度学习算法，设计了一款适用于极低照度环境下的暗光增强全彩成像系统——“夜鹰”。“夜鹰”无需任何辅助光源，即可实现1mLux级别的极低照度环境全彩成像恢复。  “夜鹰”支持单张图像采集和视频采集，其通过较为常见的通用型全彩CMOS相机采集到极低照度、高噪声的原始图像后，通过“夜鹰”神经网络模型进行处理恢复，可以将照片恢复至正常光照下的高清全彩成像效果。“夜鹰”系统支持540p分辨率下的24FPS高清稳定视频实时拍摄处理。“夜鹰”暗光增强全彩成像系统针对用户的具体使用场景进行进一步的功能开发。通过图形化用户界面，用户可以实时地查看增强恢复前后图像，并查看图片色彩直方图、视频实时帧率等信息，进行画面缩放、相机参数调节、等操作。同时，“夜鹰”内置了针对高达80种不同类别物体的人工智能目标检测系统，可根据应用场景帮助用户快速捕捉与识别画面中出现的目标。  In the absence of auxiliary methods under low illumination conditions, human’s ability to perceive the world and the imaging quality of optical imaging equipment have shown varying degrees of decline, and the images obtained will generally suffer from overall darkness, poor contrast, as well as inconspicuous details, which not only affects people's observation on the image content and subsequent using, but also poses great challenges in crime fighting, environmental protection, regional security and other relevant domains.  This project combines computer vision technology and deep learning algorithms to develop a low light enhanced full-color imaging system, "Nighthawk", which is suitable for extremely low light environments. "Nighthawk" can achieve full-color imaging recovery at 1mlx level in extremely low-light environment, without any auxiliary light source.  "Nighthawk" supports either single image capture or video capture. After a common general-purpose full-color CMOS camera acquires the original image with extremely low illumination and heavy noise, it can recover the image to a high-definition full-color image under normal illumination by using the "Nighthawk" neural network model. The "Nighthawk" system supports 24FPS HD stabilized real-time video processing at 540p resolution.  We have developed further functions for the "Nighthawk" low light enhanced full-color imaging system to satisfied specific use cases. Through the graphical user interface, users can view images before and after the enhanced recovery in real time, monitor significant information like color histogram, real-time frame rate, and perform camera parameter adjustment and other operations. At the same time, "Nighthawk" has a built-in artificial intelligence object detection system covering up to 80 different object types, which can quickly capture and recognize the targets appear in the picture according to the application scenario. | | | |

