GSOC 2022 Ideas

Projects that we maintain:
ffmpeg-vaapi, fmpeg-qsv, ffmpeg-nn: QSV and DNN in https://ffmpeg.org/
gstreamer-vaapi: https://gitlab.freedesktop.org/gstreamer/gstreamer.git (subprojects/gstreamer-vaapi)
gstreamer-msdk: https://gitlab.freedesktop.org/gstreamer/gstreamer.git (subprojects/gst-plugins-bad/sys/msdk/)
gst-va: https://gitlab.freedesktop.org/gstreamer/gstreamer.git (subprojects/gst-plugins-bad/sys/va/)
libxcam: https://github.com/intel/libxcam

Projects where we actively participate:
ffmpeg filters
Gstreamer plugins

LIST OF PROJECT IDEAS:

FFmpeg DNN inference GPU full pipeline support
Description:
FFmpeg DNN(Deep Neural Network) module has enabled OpenVINO, TensorFlow and Native as its backends. They are able to infer object detection&recongnition, Super Resolution and some other models. Additionally， we enabled the OpenVINO backend inference on GPU with commit 87cb24a, which improved the OpenVINO inference performance. While the FFmpeg decode and encode require memory copy between CPU and GPU, which lead to notable latency. It hits bottleneck when we do inference with some certain models. Therefore, we planned to support the FFmpeg DNN inference GPU full pipeline, which means the FFmpeg DNN can do all the decode, encode and inference only on GPU, without any memory copy.
Difficulty: Medium
Hardware Required: Intel CPU with iGPU(ICL with iGPU would be better)
Skill Required: C, GPU memory, DNN and Linux basic knowledge, git
Possible mentor:
Guo, Yejun(yejun.guo@intel.com)
Fu, Ting(ting.fu@intel.com)
Chen, Wenbin(wenbin.chen@intel.com)

VP9 encoder plugin based on libva hardware acceleration for Gstreamer
Description: The VP9 encoder is an efficient codec, and there is more and more hardware support for its encoding acceleration. Gstreamer as a versatile media framework, it also needs to integrate this kind hardware based VP9 encoder plugins, and libva based VP9 encoder definitely will be a good choice on Linux environment. There is already a simple vaapivp9enc plugin inside the gstreamer-vaapi repo, but its design and feature can not meet the requirement of new gstva plugins' framework, which locates in gst-plugin-bad repo and is better designed and maintained by the community during the past years.The applicant needs to implement a new libva based VP9 encoder which also conforms to the new gstva framework. The old vaapivp9enc and the new vah264enc(https://gitlab.freedesktop.org/gstreamer/gstreamer/-/merge_requests/1051) will be the good reference. Note: thisproject is related to hardware acceleration and Intel's IceLake+ platform is required.
Difficulty: Medium
Skill Required: gstreamer, C, git, media codec

Possible mentor: He, Junyan (junyan.he@intel.com)

Dense Depth Estimation from Multiple 360-degree Images (libXCam)

Description: 360-degree stereoscopic video is useful in many popular applications such as: intelligent vehicles, surveillance, virtual reality, and augmented reality. In this project we want to generate disparity map and depth information from multiple 360-degree Images that can be helpful 3D scenes reconstruction.

Unlike ordinary (perspective) cameras, fisheye cameras are used in 360-degree stereoscopic images producing pipelines. The fisheye lenses are covering wide field of view (FoV > 180°). By stitching images captured with fisheye camera array, we can compose 360-degree images, the 360-degree images usually have non-rectilinear appearances, yielding directionally dependent distortions, this can be a challenge to get accurate and robust disparity map estimation.

Difficulty: Medium

Skill Required: C++, Computational geometry, OpenCV, Image processing algorithm

Optional Skills: OpenCL, GLES

Possible mentor: Zong, Wei (wei.zong@intel.com)