MulticoreWare Inc

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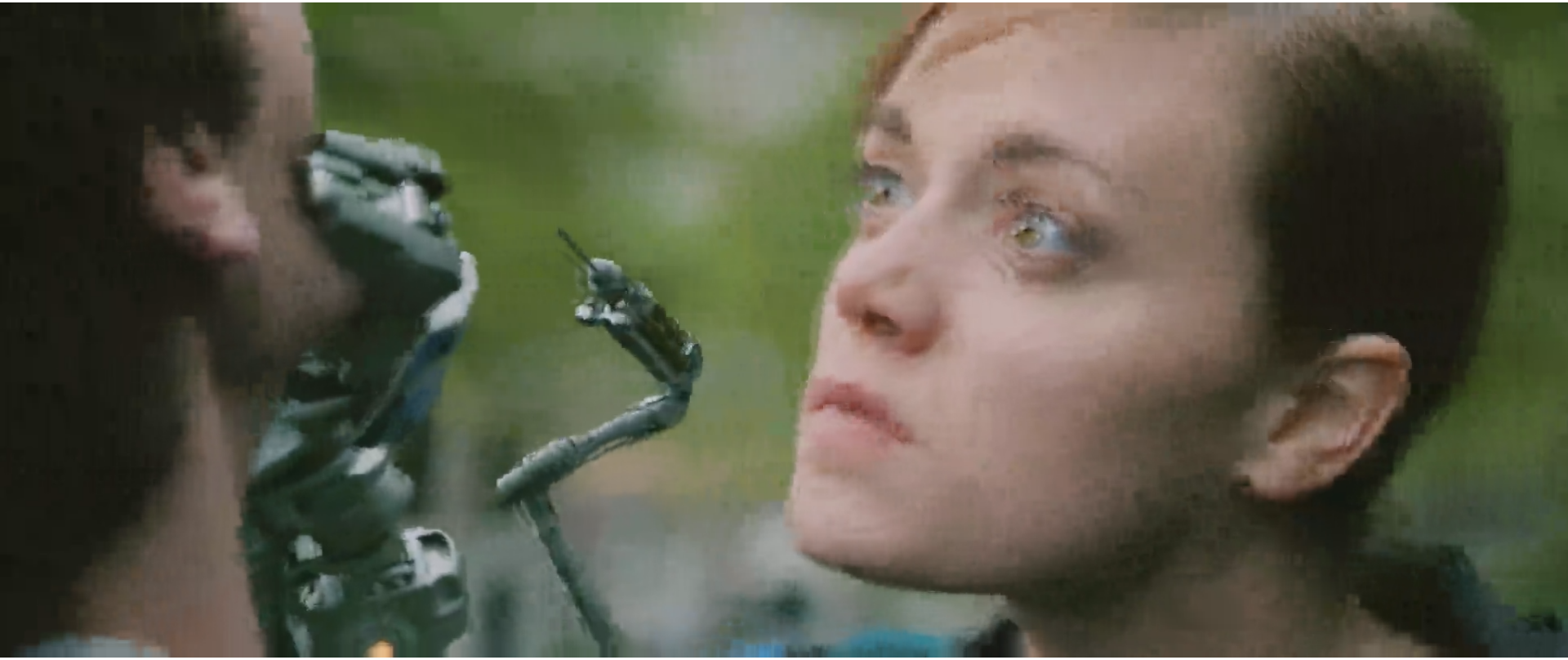
x265

- **Open-source HEVC encoder available under GPL v2**
  - Supports full HEVC spec, highly parallel, SIMD optimized
  - Successor to x264
  - bitbucket.org/multicoreware/x265
  - x265.org

- **x265 project is run by MulticoreWare**
  - Development is commercially funded (full time dev team)
  - Dual License Model (GPL v2 or Commercial License)
    - No private forks – commercial customers get same code as open source
  - All patches, bug reports, fixes in open-source

x264 @ 400 kbps



x265 @ 400 kbps

Features of x265

- All HEVC profiles and levels
  - Main, Main10, Main12, Main Still Picture
  - 4:2:0, 4:2:2, 4:4:4 variants
- HDR 10, HDR 10+, Dolby Vision HDR
- All HEVC color spaces and transfer functions
- Average Bit Rate, Constant Bit Rate, Constant Rate Factor (constant quality), Constant QP, Video Buffer Verification, 2 pass, N pass, 2 pass with spatial distortion optimization, lossless
- 10 performance presets
- Lookahead with scene and flash detection
- 6 levels of rate distortion optimization
- Temporal scalability
- Wavefront Parallel Processing
- Frame parallelism
- Slice parallelism
- Sample Adaptive Offset, Deblocking Psychovisual optimizations
- Adaptive Quantization
- CU Tree optimization
- Fully configurable encoding - # ref frames, min/max CU size, RECT, AMP, GOP structure, keyframe interval, motion search method and range, subpel refinement, cu lossless
- Limit Modes, Limit Refs
- Analysis Save, Analysis Load 2 pass
- Tune psnr, ssim, grain, zero-latency, fast-decode
- Pools – assign threadpools on specific cores
- Region of Interest optimization
- VUI and SEI message support
- Reconfigurable on the fly
- Comma Separated Value logging
- Full API
- x265 is the default HEVC encoder in FFMPEG
- Documentation is part of source code
- Online Documentation x265.readthedocs.io

HEVC Adoption

- **Device support for HEVC playback is nearly ubiquitous**
  - Most new TVs are 4K/HDR HEVC capable
  - Most PC Chipsets (Intel/AMD/NVIDIA)
  - All connected STB (Roku/Amazon/AppleTV/GoogleCast)
  - All flagship phones support HEVC
    - Samsung Galaxy S8, Note 8, Book 12, Tab S2; Sony Xperia XZ Premium; LG G6; MS Surface books; iPhones since 5s will support HEVC with iOS 11 update (Tuesday!)
- **Platform support for HEVC gaining popularity**
  - MacOS High Sierra/iOS11 using HEVC for video, and images; in 1 week!
  - Android support for HEVC mandatory for playing back HDR content
- **Broadcasters transitioning to HEVC**
  - ATSC 3.0, DVB-T2 standards based on HEVC

x265 Improvements in the past year

- **Encoding efficiency (quality @ bit rate)**
  - New lambda tables for main, main10, main12
  - SSIM-based RDO
  - SEA motion search
  - HDR optimization
  - 2-pass spatial distortion optimization
- **Performance**
  - Limit-tu, limit-sao, dynamic-rd
- **Other improvements**
  - Dynamically reconfigure bitrate on the fly (via API)
  - Different levels of analysis reuse and refinements (via API)
  - Samsung HDR10+ (SMPTE 2094-40) support
  - Assembly optimizations for ARM, POWERPC

Contribute!

- **Help define the video and still image compression**
  - HEVC starting to replace AVC everywhere
  - Replacing JPEG2000 with HEIF as the image standard

- **Welcome ideas & collaboration towards improving x265**
  - Contribute to the world's leading HEVC encoder implementation
  - See us here, or in the Intel booth (5.B65)

- **Actively participate in open-source multi-media community**
  - Developer Mailing List - x265-devel@videolan.org
  - x265 discussions on Doom9 forums