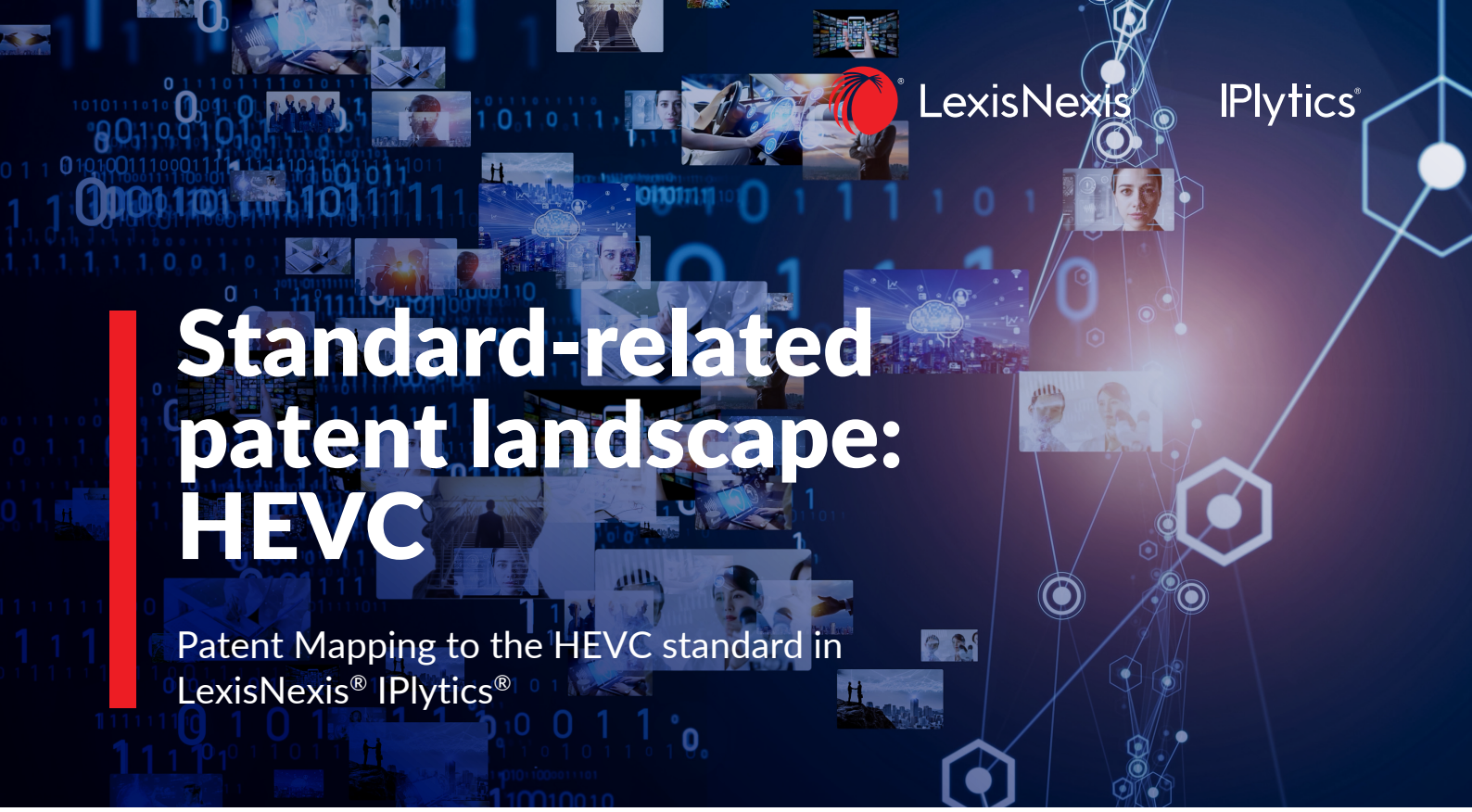

LexisNexis® IPlytics®

Standard-related patent landscape: HEVC

Patent Mapping to the HEVC standard in LexisNexis® IPlytics®

General Scope

HEVC, an acronym for High-Efficiency Video Coding, represents a cutting-edge video compression standard designed to provide superior efficiency in encoding and decoding video content. Also known as H.265, HEVC is a successor to AVC/H.264, aiming to deliver higher compression ratios without compromising visual quality. The primary objective of the HEVC standard is to enable the efficient transmission and storage of high-definition and ultra-high-definition video content, making it a key technology for applications such as 4K and 8K video streaming, broadcasting, and video conferencing.

References

- According to the International Telecommunication Union (ITU), HEVC is recognized as a pivotal advancement in video coding technology. The ITU acknowledges HEVC's ability to achieve significantly improved compression efficiency compared to its predecessors, stating that it "provides an essential tool for the delivery of high-quality video services over various networks and platforms." The standard is positioned as a crucial element in meeting the growing demands for higher resolution and immersive video experiences.
  Source: *itu.int*

- Industry reports from the Joint Collaborative Team on Video Coding (JCT-VC), a collaboration between the Video Coding Experts Group (VCEG) and the Moving Picture Experts Group (MPEG), highlight the widespread adoption and deployment of the HEVC standard in modern multimedia ecosystems. The reports emphasize HEVC's role in enabling efficient video compression for a range of devices and applications, including smart TVs, mobile devices, and video-on-demand services.
  Source: *jctvc.org*

HEVC standard	Topics (positive concepts)
Relevant concepts	▪ H.265 is an approved video compression standard formally published in 2013 as a successor to the H.264/AVC standard. The key goal of the standardization of H.265 is to significantly improve compression efficiency relative to previous standards. ▪ H.265 Features/Components: Coding Tree Unit (CTU) / Largest Coding Unit (LCU): ▪ Provides a hierarchical and flexible structure for encoding and decoding video frames efficiently. ▪ The maximum CTU size is 64x64 pixels in H.265, representing an improvement over the macroblock structure used in H.264. High-Level Syntax (HLS): ▪ HLS is everything related to the Network Abstraction Layer (NAL). ▪ Key purpose of the HLS design is to provide an interface of a video codec to various networks/systems where the video codec is used. Block Partitioning: ▪ H.265 has adopted a flexible and efficient block partitioning structure by introducing four block concepts: coding tree unit (CTU), coding unit (CU), prediction unit (PU) and transform unit (TU). Intra Prediction: ▪ Entails predicting the pixel values with a block based on neighbouring pixels within the same frame. The calculation involves determining the difference between actual pixels and the predicted pixels (residuals). ▪ 35 intra-frame prediction modes (DC Mode + Planar Mode + 33 angular intra prediction modes) in H.265. Intra Prediction: ▪ Inter prediction involves using previously encoded frames as references to predict the current frame's pixels. Motion compensation is applied to align the reference frame with the current frame, and residuals are calculated. Transformation and Quantization: ▪ Residuals obtained from Intra & Inter Prediction are transformed using Discrete Cosine Transform (DCT) and Discrete Sine Transform (DST). ▪ Quantization – Purpose of quantization is to map the output values from the transformation, which are continuous, onto discrete values that can be coded into the bitstream. Loop Filtering: ▪ In-loop filtering is a process used to reduce or completely remove coding artifacts. ▪ H.265 incorporates a Deblocking Filter and Sample Adaptive Offset Filter. Entropy Coding: ▪ Reduces the average bitstream length, or equivalently, the average number of bits required to represent information within a picture. ▪ H.265 uses Context-Based Adaptive Binary Arithmetic Coding (CABAC).

HEVC standard	Topics (negative concepts)
No relevant concepts	Image Compression: ▪ Image compression shares similar concepts to video compression (e.g. Transform Coding, Quantization and Entropy Coding). Image compression has its own set of standards including JPEG, PNG, GIF etc. Audio Coding: ▪ Shares similar concepts to video compression (e.g. Transform Coding, Quantization and Entropy Coding). Audio coding standards include Advanced Audio Coding (AAC), MP3 etc. Point Cloud Compression (PCC): ▪ Point Clouds are sets of tiny "points" grouped together to make a 3D image. Point Cloud has become a popular method for AR and VR video composition and was standardized in 2020 (V-PCC, S-PCC & L-PCC). ▪ **H.26X Features/Components (Not in H.265):** Macroblock: ▪ H.264 processes video frames using macroblock whereas the standards following (H.265 onwards) use Coding Tree Units. Improved Maximum Coding Tree Unit (CTU) Size ▪ The maximum CTU size is 128x128 pixels for H.266 compared to 64x64 pixels in H.265. Quadtree with Nested Multi-Type Tree: ▪ Introduced to H.266 as an improvement to block partitioning that supports Binary-Tree and Ternary-Tree splits in both vertical and horizontal directions. Increased Intra Prediction Modes: ▪ Increased Intra Prediction modes in H.266 which improves the accuracy of the prediction. CAVLC (Context Adaptive Variable Length Coding): ▪ An entropy coding method used in H.264. Dependent Quantization: ▪ H.266 adopts dependent quantization, which can be a form of sliding block vector quantization. In-Loop Filtering: ▪ Further In-Loop Filtering methods were introduced to H.266 including the Adaptive Loop Filter, Cross-Component Adaptive Loop Filter, and Luma Mapping with Chroma Scaling.