National Institute of Justice

Award Title: Familial DNA Database Search System-Hardware/Software Integration Project

Award Description:

Familial DNA searching is a valuable investigative tool used in both the United Kingdom and the United States to derive forensic DNA-based intelligence to assist in criminal investigations. Currently, five states (Colorado, California, Wyoming, Virginia, and Texas) have implemented familial search programs, led by Colorado in 2008. Familial searching has the potential to significantly leverage the Combined DNA Index System (CODIS) database to detect siblings and parent-child relatives within existing DNA databases, which would assist in the identification of perpetrators of crimes where DNA has been recovered. However, the current ability of the criminal justice field to conduct familial DNA searches is limited. At this time, a Familial Search Program exists which was collaboratively developed by the Denver Police Department and the Denver District Attorney¿s Office (DA) to compile, search, and report potential familial relationships from existing forensic DNA data stored in the CODIS databank. However, the existing system is a standalone system that requires installation of local hardware and software. Although the current system has generated significant interest (now being used in Wyoming and Virginia), it lacks the ability to reach large audiences of users and the computational power to handle large datasets and searches. Research goals and objectives: The proposed effort directly impacts the discipline of DNA with a goal of enhancing current approaches to interpret forensic data derived from physical evidence, including an assessment of the significance of association and providing analyses that provide quantitative measures and statistical evaluation of forensic evidence. To do this, the Denver Crime Laboratory will partner with the Denver DA and DRC Computer Corporation to produce the following objectives: 1. Produce a web-based familial search system that operates with DNA data allowing secure data transmission via a graphical interface for determination of relatedness which can be used by law enforcement/crime laboratories nationally. 2. Determine the utility of using Expected Match Ratio (EMR) and Expected Kinship Ratio (EKR) calculations to detect true-positive results by applying the analysis to existing known familial matches from Denver DNA data. Relevance to criminal justice public policy or practice: The produced web-based familial search system will allow millions of comparisons between DNA profiles, allowing familial or exact match (CODIS matches) to be derived in seconds over an encrypted and secure data environment. This tool would help law enforcement particularly in cases that have exhausted current investigative leads by opening up possibilities of for generating new investigative leads within minutes. This tool, along with the EMR/EKR analysis results, can help to narrow potential familial matches to a handful for further identification. Proposed Method: The Denver team of expert practitioners will partner with DRC, one of the leaders in the design and manufacture of advanced coprocessors to engineer and develop the new system. This partnership has already delivered a proof of concept model demonstrating architecture for a high performance familial search system. Together, the team will create a robust web-based system. Expected Deliverables: A fully developed familial search system that operates with DNA data allowing secure data transmission and graphical interface for determination of relatedness; An online demonstration for interested agencies to learn about and test the familial DNA search system; A report on the analysis of EMR/EKR calculations which will be submitted for publication in a scientific journal suitable for publishing; Final reports for each completed phase and an analysis report regarding hardware enhancements. ca/ncf

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