



## Success Story

Intel® Software Partner Program  
Multi-Core-Initiative



*"Parallel processing is of great value for speech recognition. The tools offered by the Intel Software Partner Program helped us to easily utilize the latest parallel processing technologies offered by Intel,"*  
says Cetin Cetinturk, CTD Systems.

### Challenge:

To optimize the accuracy and recognition speed of context-independent speech recognition software.

### Solution:

CTD Systems registered with the Intel Software Partner Program and used parallel programming and SSE instructions.

### Learn more:

[www.intel.com/partner](http://www.intel.com/partner)  
[www.dikte.com.tr](http://www.dikte.com.tr)

## Precision with Intel® Multi-Core Platforms

### CTD System's Dikte speech recognition software is faster and more accurate thanks to parallel programming

Developing a fast and reliable speech recognition application is a huge challenge for the software industry. In order to increase accuracy and performance, the speech recognition research company CTD Systems has optimized its context-independent dictation program Dikte for Intel multi-core platforms. During the development phase, the company received strong practical support from the Intel® Software Partner Program.

### Setting the bar: real-time recognition with a vocabulary size of 300 billion words

In 2005, CTD Systems set itself a major challenge: Following the success of its speech recognition software Medical Dikte with a vocabulary size of 100K words, the Turkish company planned to develop a context-independent version. Targeting the entire Turkish language, this program would have to support an enormous amount of vocabulary. This effort required the development of complex algorithms due to the agglutinative nature of the Turkish language, since millions of new word forms can be generated from only a single stem using inflectional or derivational suffixes. Moreover, the language has no strict word order. The Dikte Speech Recognition engine would have to handle an unmatched complexity.

In 2007, the breakthrough was finally accomplished. The company had developed an incredibly fast acoustic recognition algorithm with a smartly designed language model. These two major inventions led Dikte to break the limits of speech recognition technology by achieving real-time speech recognition using a vocabulary size of 300 billion words. The program now features the power of generating word forms, along with their suffixes, during dictation. The design takes advantage of modern processor technologies rather than relying on computer memory, which would not be sufficient for such an extensive vocabulary. The number of words Dikte supports is an impressive benchmark for the competition. Furthermore, the software also adapts automatically to the voice, tone and talking speed of the user and learns from speaker corrections noted during the speech recognition process.



*"Dikte is an excellent example of how the future of powerful applications lies in parallel programming. Intel is proud to have helped CTD Systems optimize its splendid speech recognition software with the Software Partner Program."*

*– Cigdem Ertem, Intel® Turkey Country Manager*

## **Intel Software Partner Program helped implement optimizations**

The main problem facing researchers of speech recognition technology is the limitation of processing power and memory capacity. *"Current speech recognition technology is too weak compared to human recognition ability. I can say that speech recognition is still in its infancy. The basic reason is the insufficiency of computing power and memory size available. So, accuracy is sacrificed for speed. Since we have very strong recognition algorithms that demand much more processing power than available, we focused on using parallel processing and new SSE instructions in order to make our recognition engine fully utilize the latest multi-core platforms from Intel. The accuracy and speed of Dikte were drastically increased. Our hope is that in the future, parallel processing technologies like multi-core processing and SSE instructions will help us build a speech recognition engine that can compete with the human recognition ability,"* says Cetin Cetinturk, CEO of CTD Systems.

To give its developers the best possible support, CTD Systems joined forces with the Intel Software Partner Program. CTD developers benefited from the experience and the know-how of Intel while optimizing Dikte's utilization of the multi-core technology of Intel processors. In addition, CTD Systems used Intel Software Development Kits (SDKs) and worked directly on the latest Intel platforms, which helped reflect the latest technology advancements to the software. The advanced programming environment supported by Intel tools accelerated the development and improved the debugging processes. *"Our team was ecstatic to find a solution to every possible optimization point during the study,"* says Cetin Cetinturk. *"As each improvement*

*helped to enhance the processor's utilization and the real-time recognition accuracy, developers were really excited to see their strong algorithms in action!"*

The results of the implemented optimizations are clearly visible: Dikte's performance scaled by a factor of 3.2 from one to four cores with a recognition accuracy of over 95 percent. Dikte now fully utilizes the power of the underlying hardware platform to produce the best outcomes with strong recognition techniques.

*"As a result, we greatly enhanced our recognition engine with minimal effort, thanks to the professional support we had from Intel. We will continue providing optimal recognition engines utilizing parallel processing techniques that reveal the power of the latest Intel processor technologies,"* says Cetin Cetinturk.

## **A strong partner now and in the future**

The team at CTD Systems certainly isn't short of plans for the future. Industry-specific versions of Dikte are currently in preparation, as well as a solution for use in cellular phones and PDAs. In addition, Medical Dikte is now running on the Mobile Clinical Assistant (MCA) from Intel, helping clinicians access patient records by voice commands at the point of care.

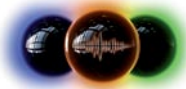
The maturity of the recognition engine also means that it can easily be adapted to any other human language; adaptation of Dikte to recognize English has already started. All of these projects will further be boosted by support from the Intel Software Partner Program.

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## **About the Intel® Software Partner Program**

The Intel® Software Partner Program provides a framework for collaborative solution development around Intel architecture. From business planning and product development to marketing and sales, the program drives increased business success and market opportunities.

Success Story by:



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