



DEPARTAMENTO DE INGENIERIA ELECTRICA
SECCION DE ELECTRONICA DEL ESTADO SÓLIDO

GRUPO DE SISTEMAS VLSI

Investigadores:

Dr. José A. Moreno Cadenas

Dr. Mario A. Reyes Barranca

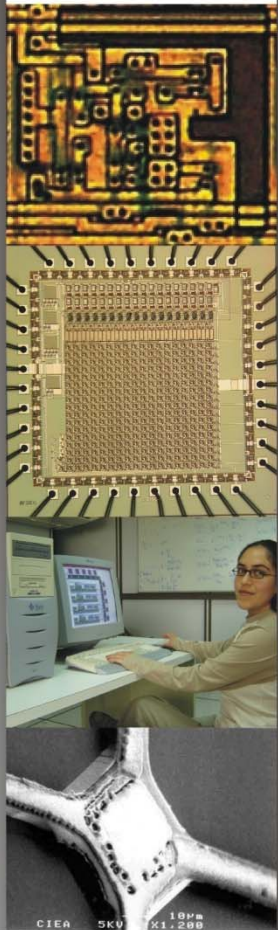
Dr. Felipe Gómez Castañeda

Auxiliares de Investigación:

Dr. Oliverio Cárdenas Arellano

M. C. Luis Martín Flores Nava

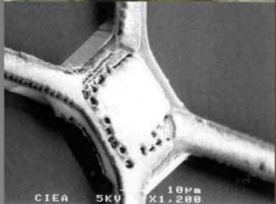
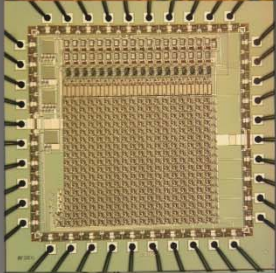
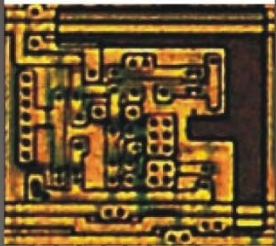
M. I. Emilio Rafael Espinosa García



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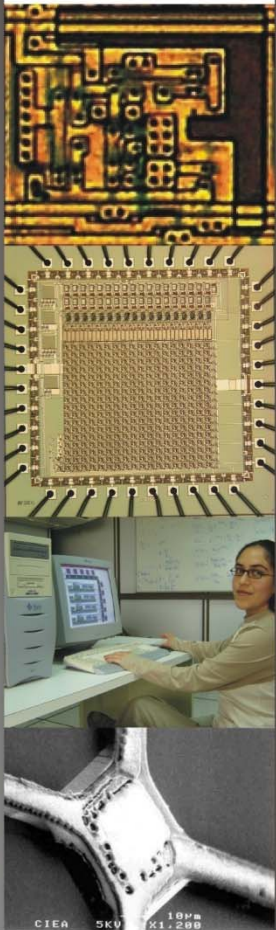


CIEA 5KV 10µm X1.200

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Líneas de Investigación

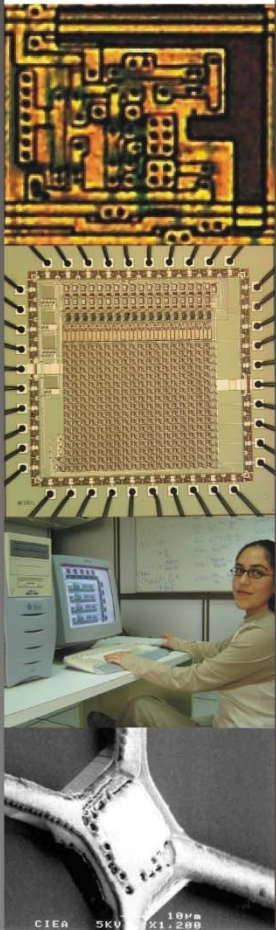
- ❑ Diseño de Circuitos Integrados Analógicos CMOS
- ❑ Desarrollo de Prototipos en Tecnología de Componentes VLSI digitales-FPGA



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Líneas de Investigación

- ❑ Diseño de Sistemas MEMS (Micro-Electro-Mechanical Systems)
- ❑ Desarrollo de Métodos para Análisis de Datos basados en Técnicas Neurodifusas



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Temas de Investigación

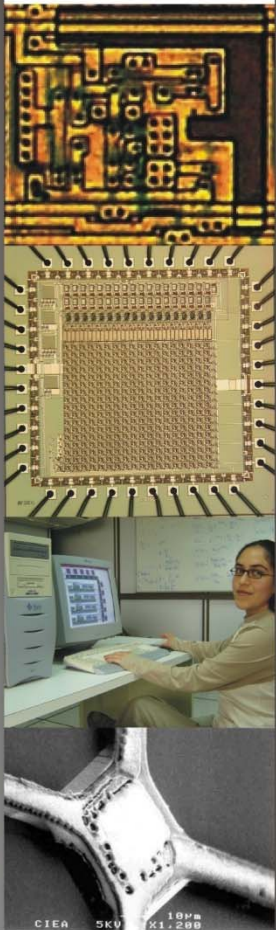
1. Diseño, fabricación y caracterización de circuitos integrados CMOS para:
 - Sistema de detección de movimiento para coordinación visual-motora de brazo robótico en tiempo real.
 - Sistema de análisis de imágenes en tiempo-real con estructura de red neuronal celular
 - Sistema de predicción en series de datos muestreados
 - Sistema de conversión analógica-digital basado en modulador sigma-delta



Temas de Investigación

2. Diseño, construcción y caracterización de sistemas en tecnología de componentes FPGA

- Sistema de control de un vehículo prototipo basado en algoritmos de lógica difusa
- Robot autónomo con procesamiento de visión empleando una tarjeta Spartan 3E
- Sistema de análisis de señales basado en teoría de componentes principales y con estructura de red neuronal artificial



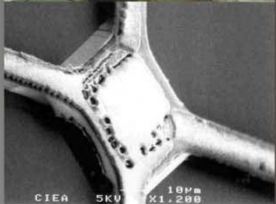
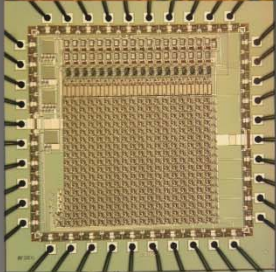
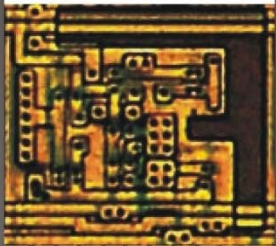
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Temas de Investigación

3. Diseño, fabricación y caracterización de MEMs para:

- Ejemplo de lo que son MEMS
- Sistema de detección de gases

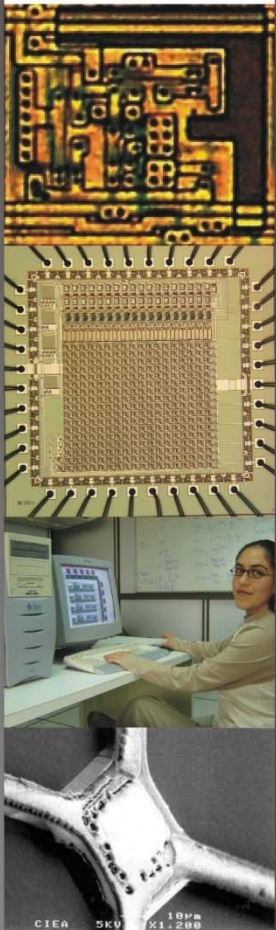


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Temas de Investigación

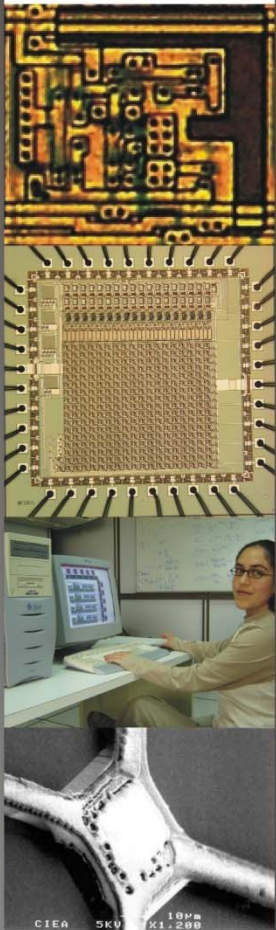
4. Desarrollo de métodos para análisis de datos basados en técnicas neurodifusas
 - Modelación de biopilas
 - Programa de cómputo para estimar la proporción de tipos de crudo en una mezcla de hidrocarburos
 - Detección de arritmias PVC



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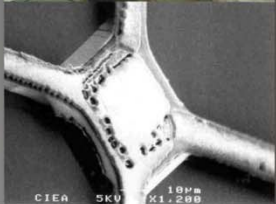
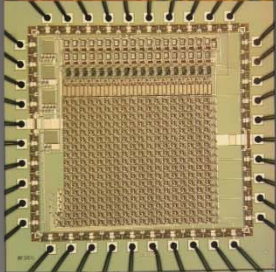
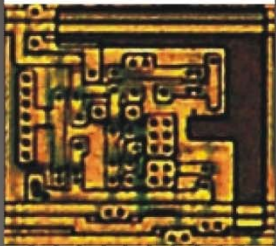
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Infraestructura

- Red de computadoras personales y estaciones de trabajo
- Software de diseño a nivel sistema, eléctrico y nivel tecnológico
- Equipo para mediciones eléctricas y de desempeño de tarjetas en tecnología analógica, digital y mixta



Laboratorio de diseño



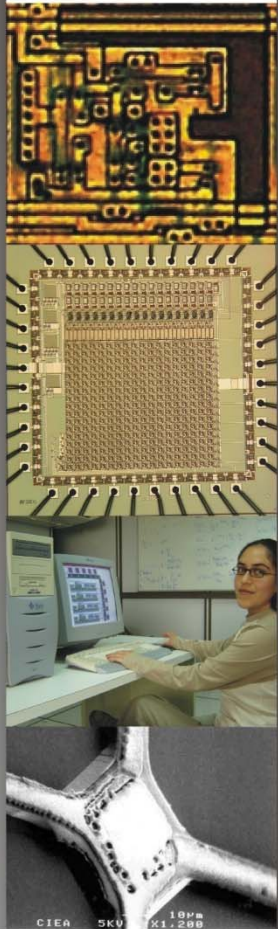
CIEA 5KV 10µm X1.200

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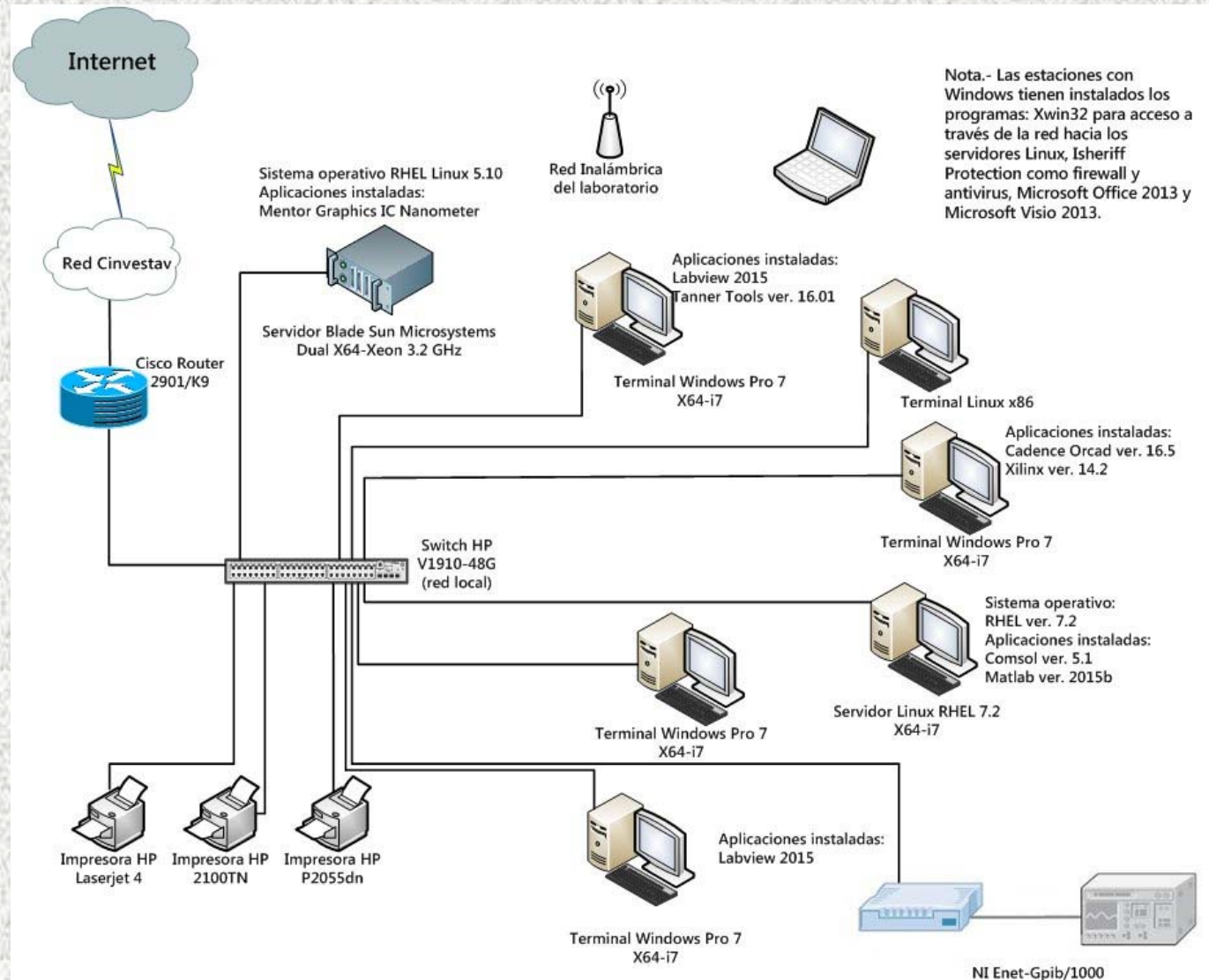




Laboratorio de diseño

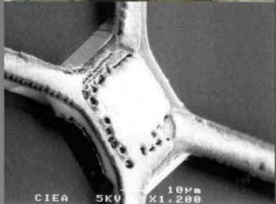
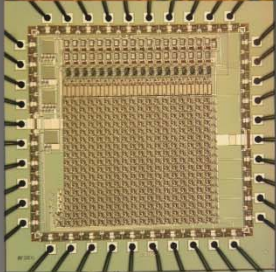
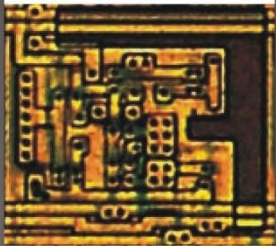


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CIEA 5KV 10µm X1.200

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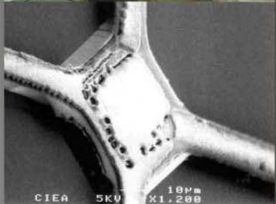
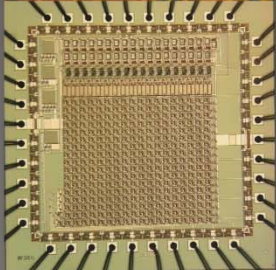
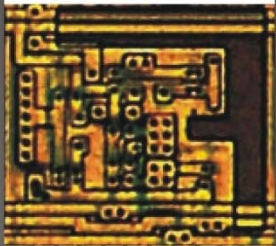
Fin de la presentación





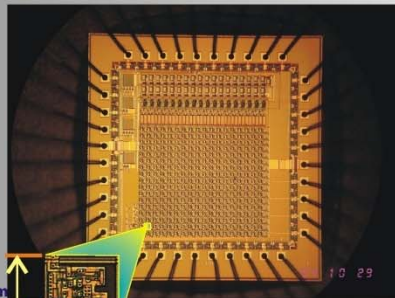
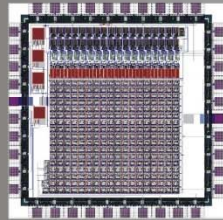
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Sensor CMOS y Aplicación

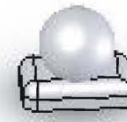
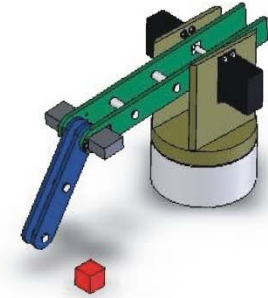
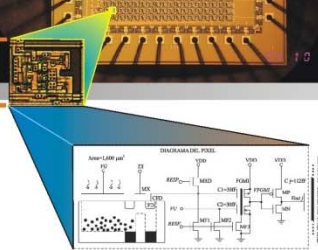


CIEA 5KV 10µm X1.299

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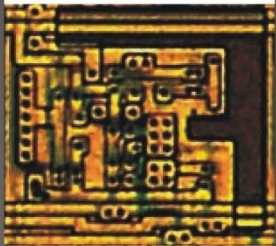


69µm

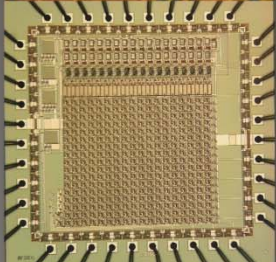




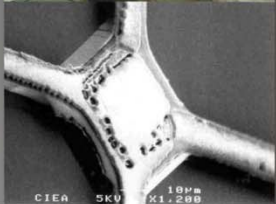
Microfotografía de sensor CMOS



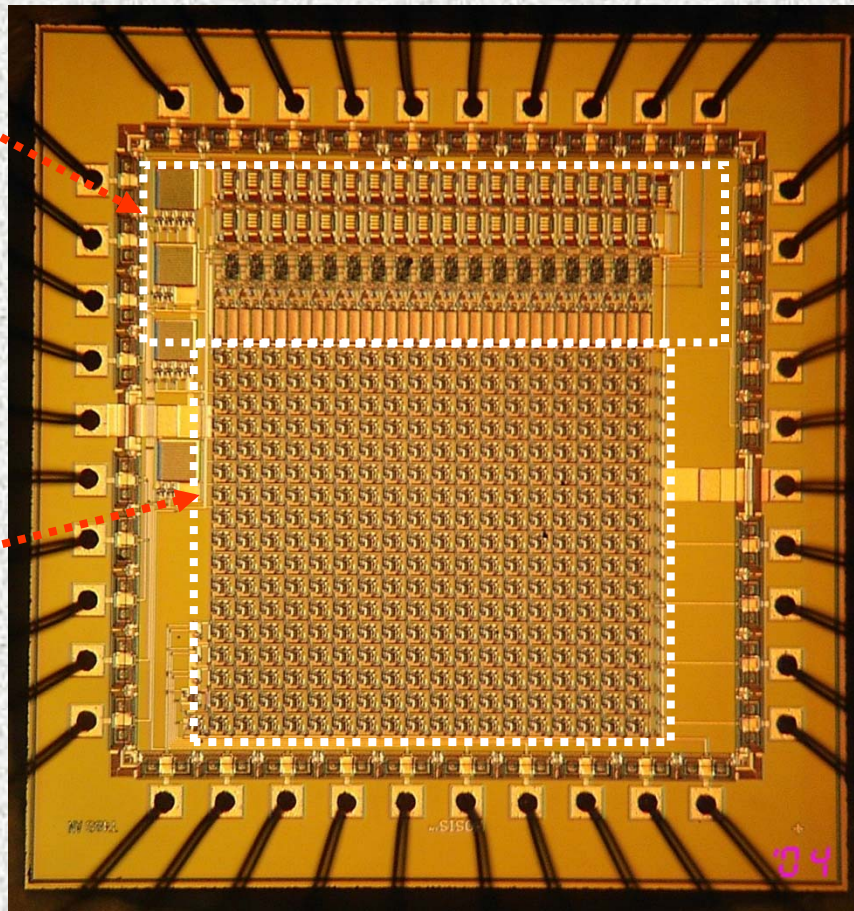
Bloque de proceso analógico del centroide



Matriz fotodetectora

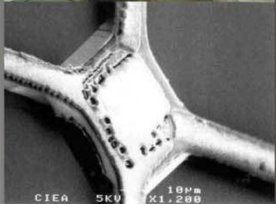
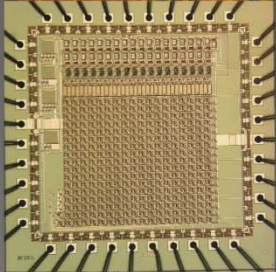
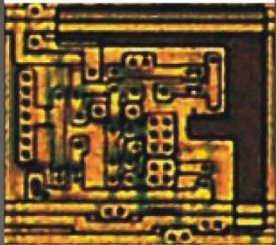


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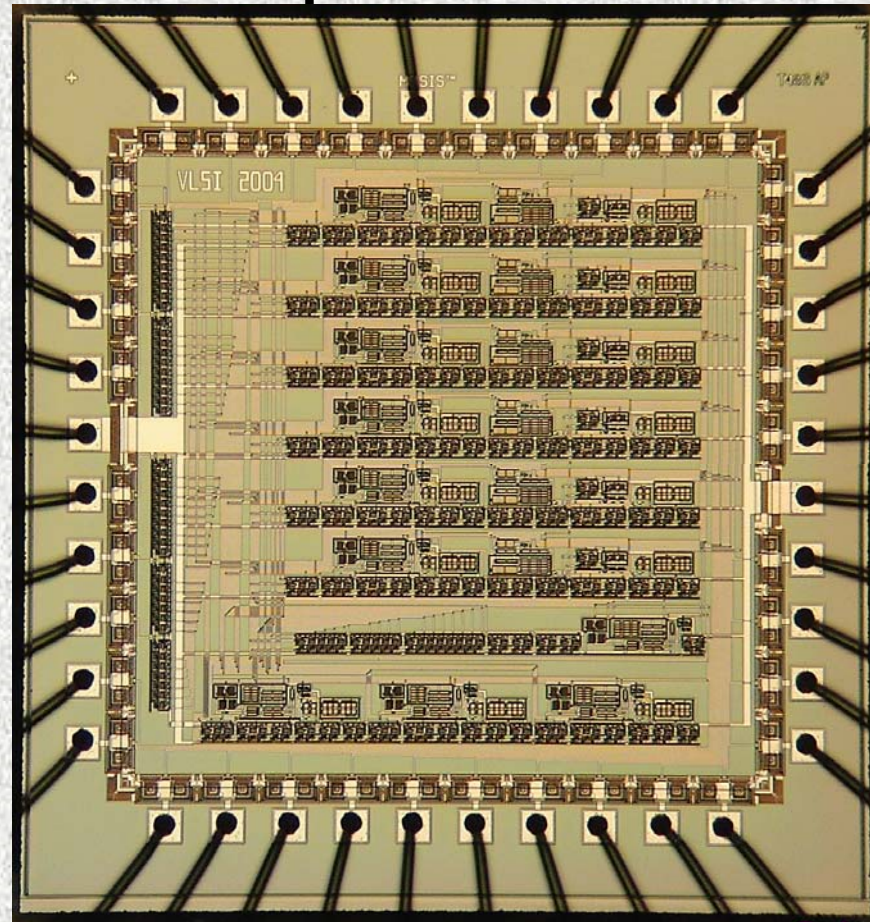
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Microfotografía de Red Neuronal Adaptable

A) Algoritmo LMS

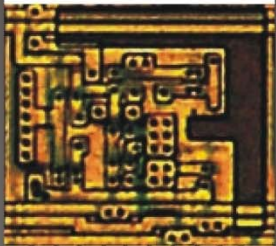
B) Proceso no lineal basado en polinomio de segundo orden de dos variables

C) Tarea: predicción





Microfotografía de Red Neuronal Celular (CNN)



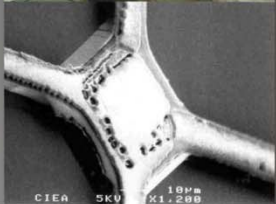
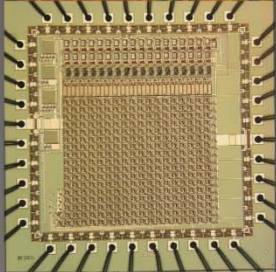
Matriz CNN 4x4 .

Tareas:

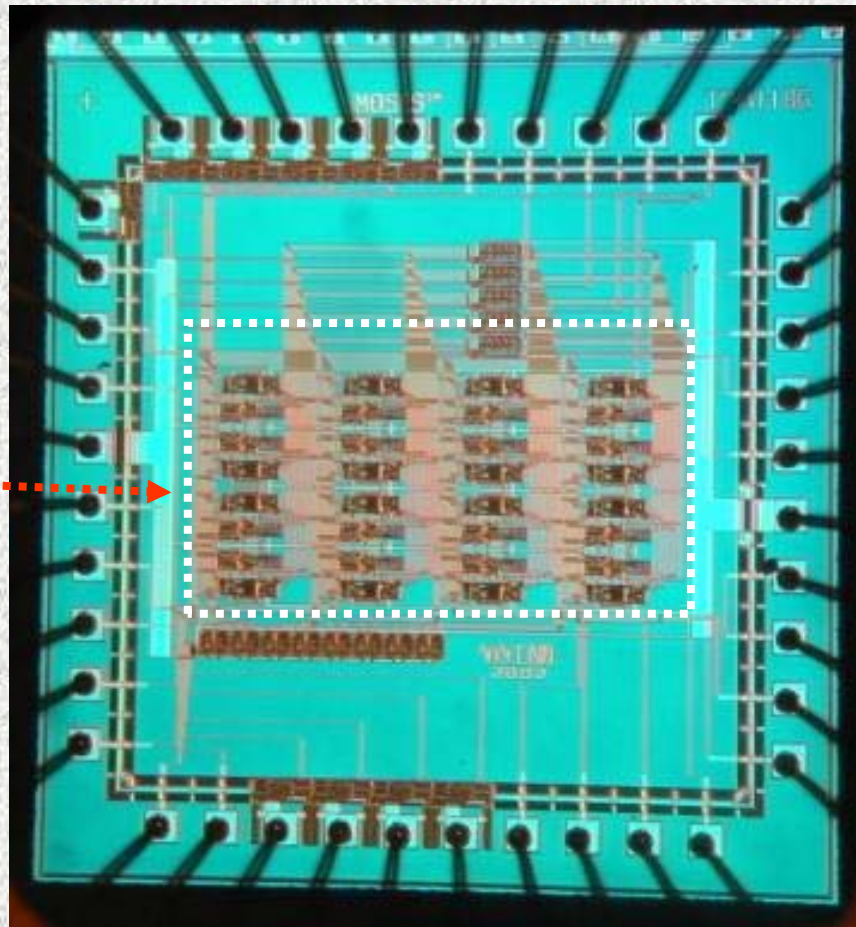
A) Detección de bordes en tiempo real (200ns)

B) Detección de componentes conectados

Tecnología de transistor de compuerta flotante

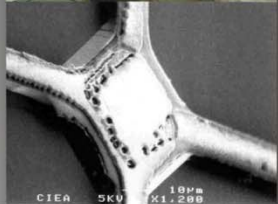
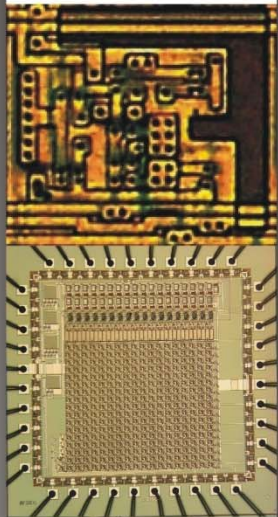
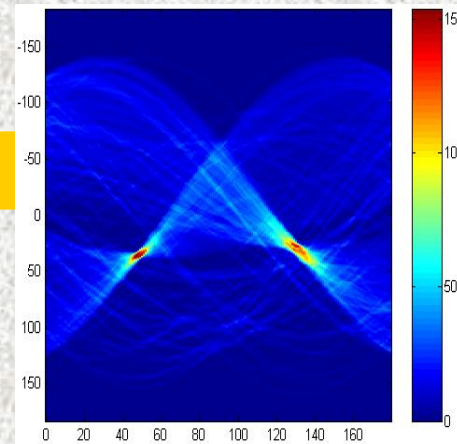
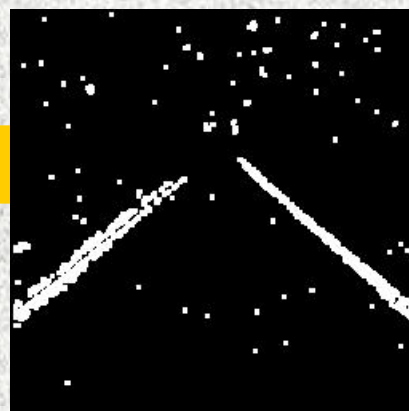
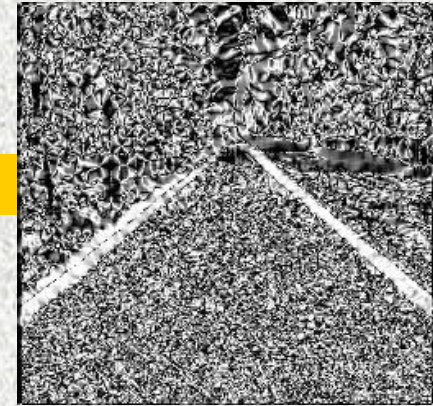
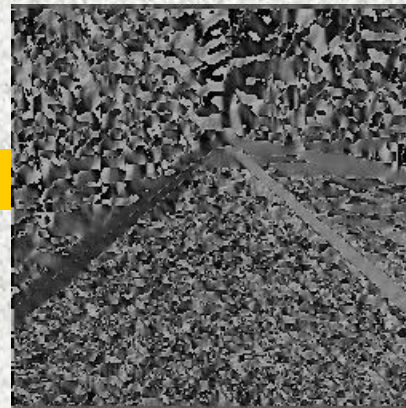


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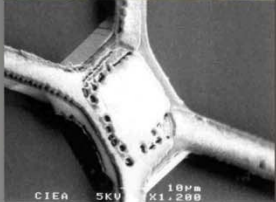
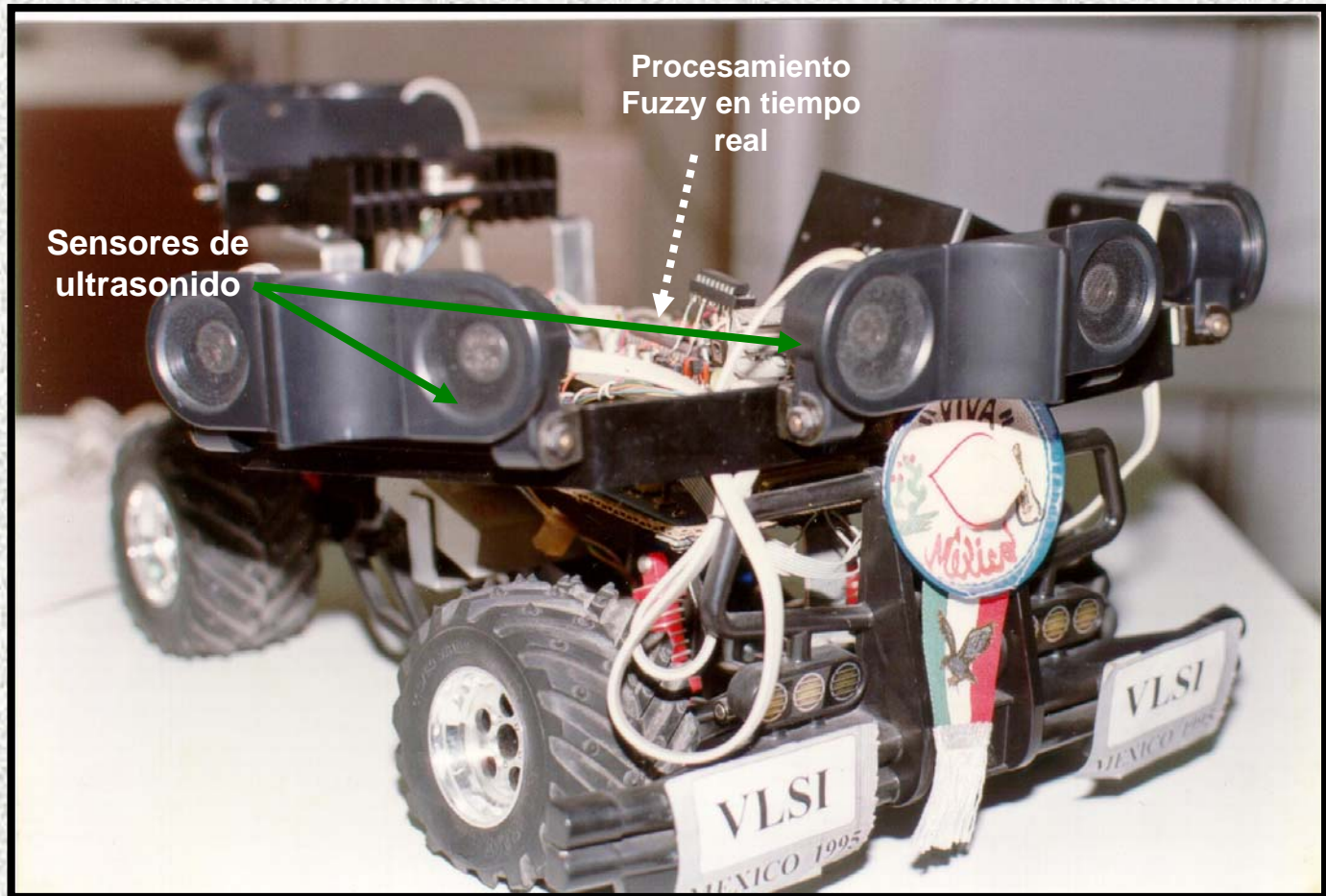
Procesamiento Difuso de Imagen (Detección de Bordos para Navegación Autónoma)



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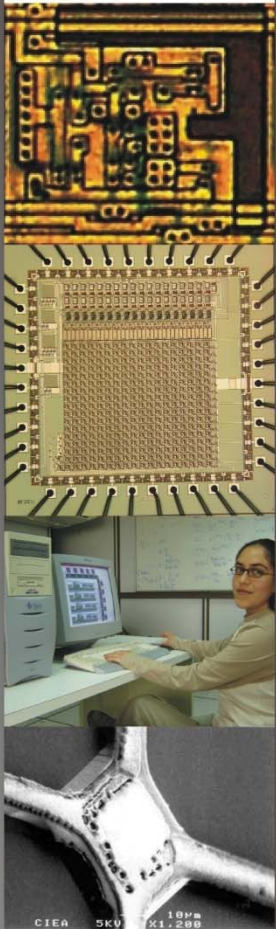
Prototipo de vehículo de navegación autónoma V1.0



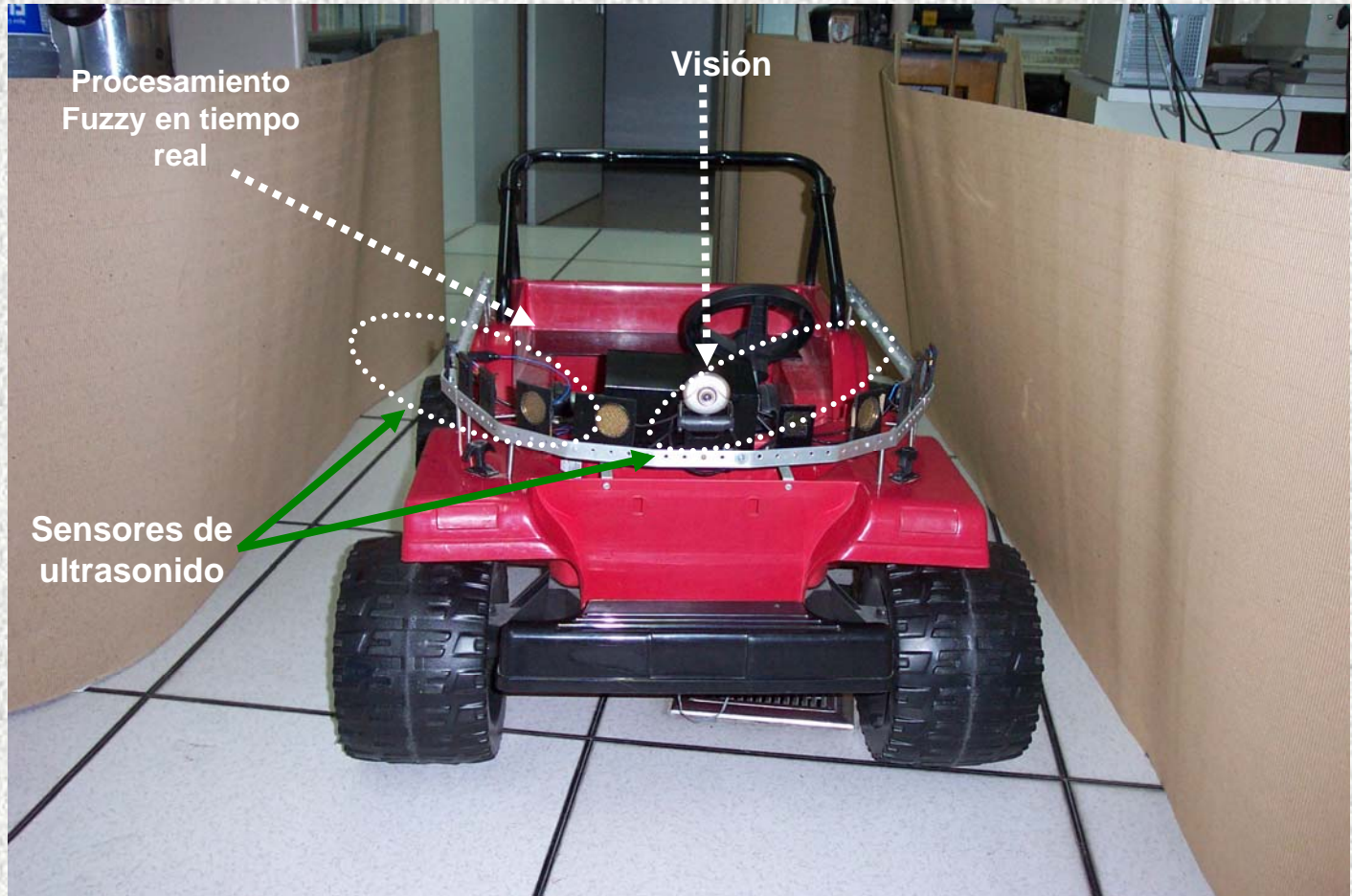
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Prototipo de vehículo de navegación autónoma V2.0

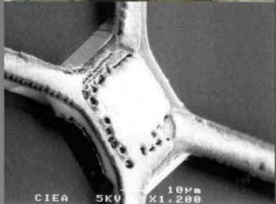
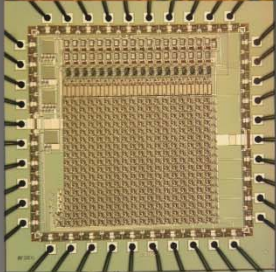
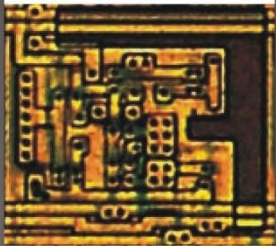


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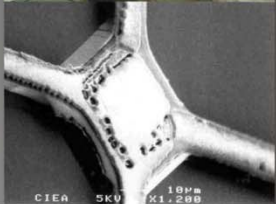
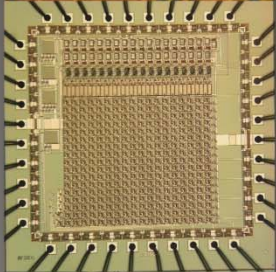
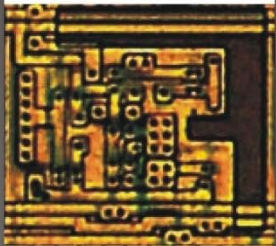
Robot autónomo con procesamiento de visión empleando una tarjeta Spartan 3E

Robot autónomo con procesamiento de imagen empleando la tarjeta de evaluación Spartan 3E de FPGAs de Xilinx





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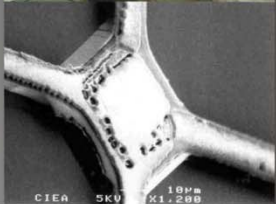
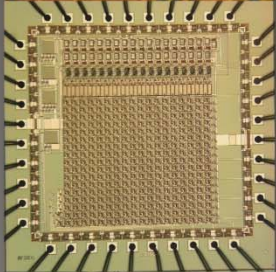
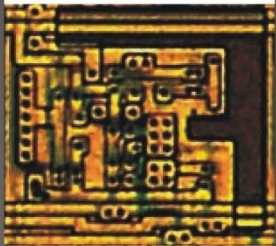
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Sistema de análisis de señales basado en teoría de componentes principales y con estructura de red neuronal artificial



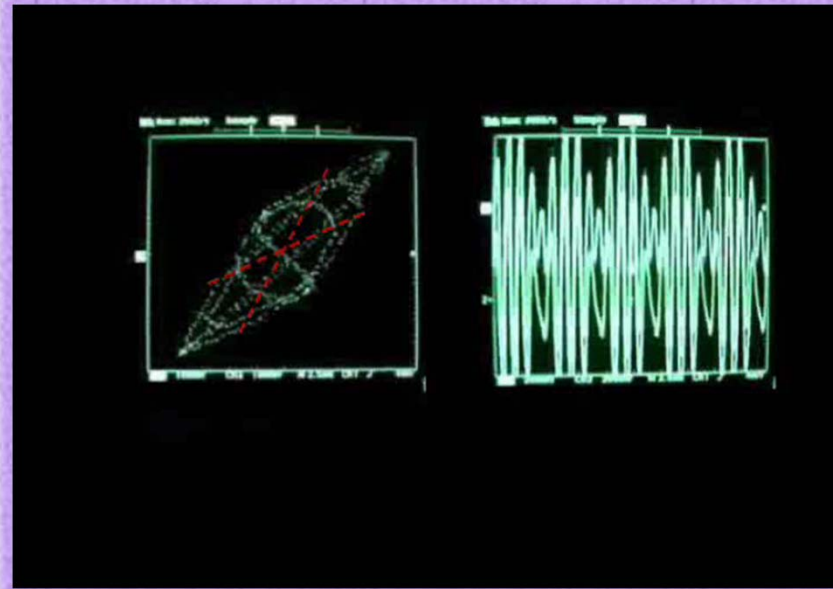
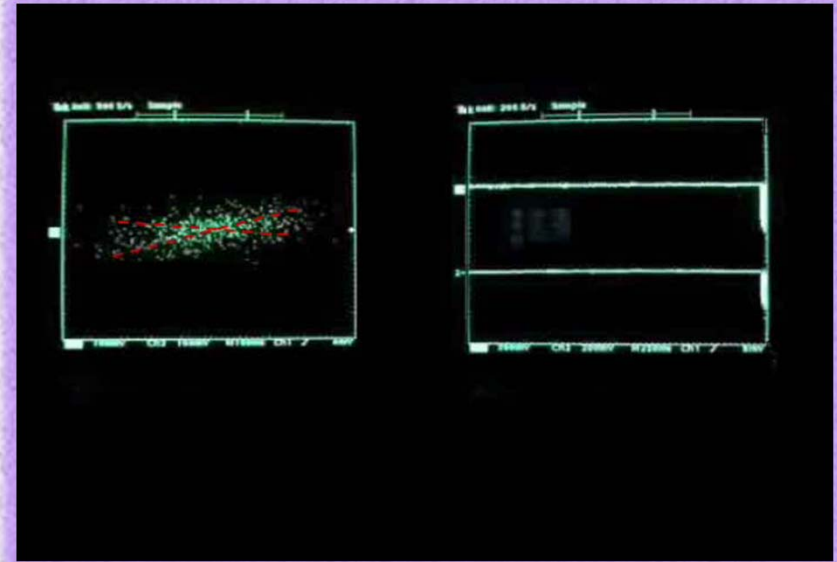


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Separación de
señales de
audio

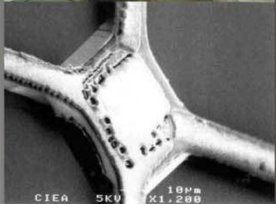
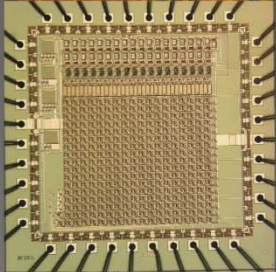
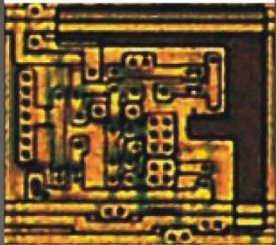


Separación de
señales
senoidales





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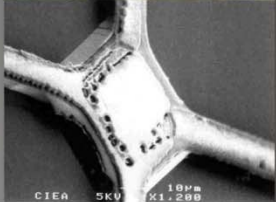
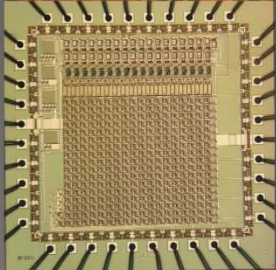
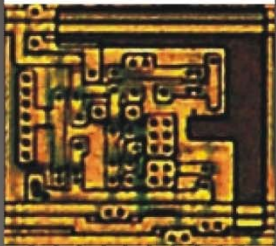
Algunos ejemplos de Sistemas Micro-Electro-Mecánicos (MEMS)



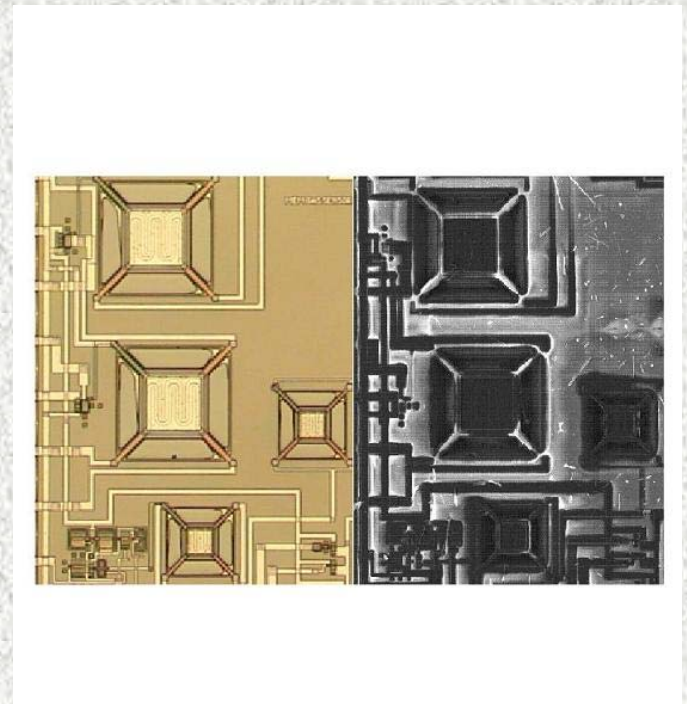
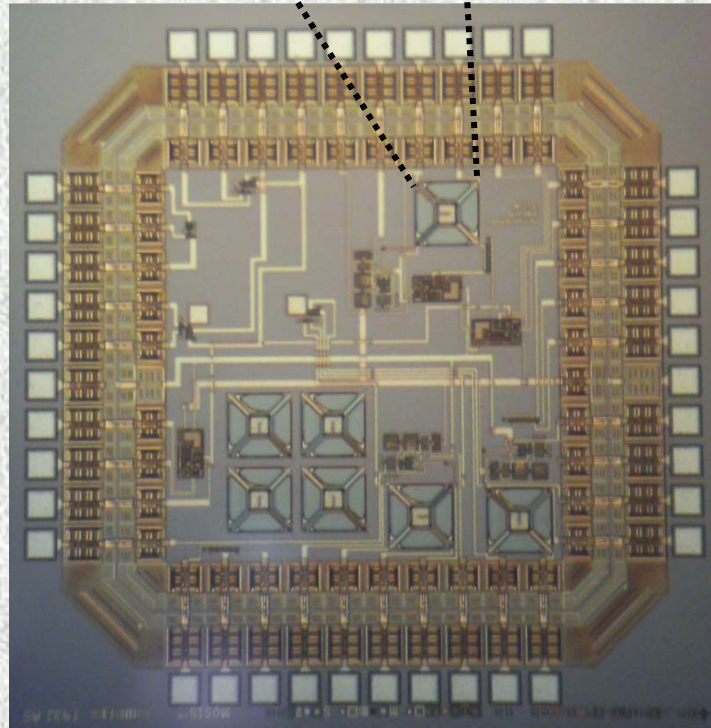
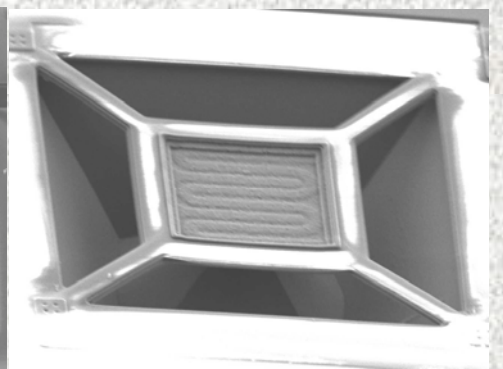
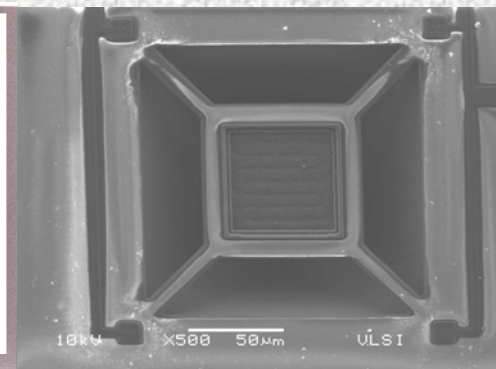
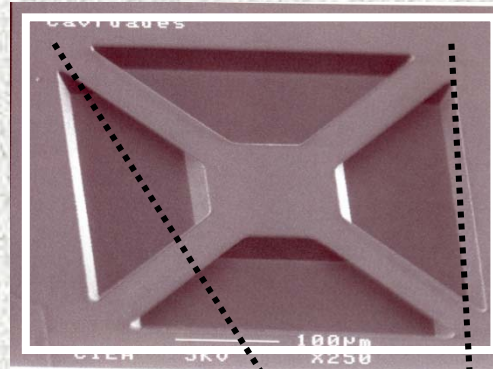


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Microfotografía (SEM) de Grabado de Fosos

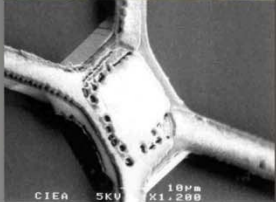
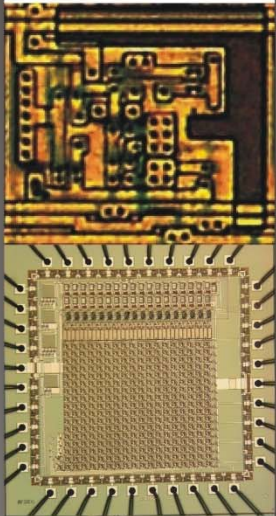


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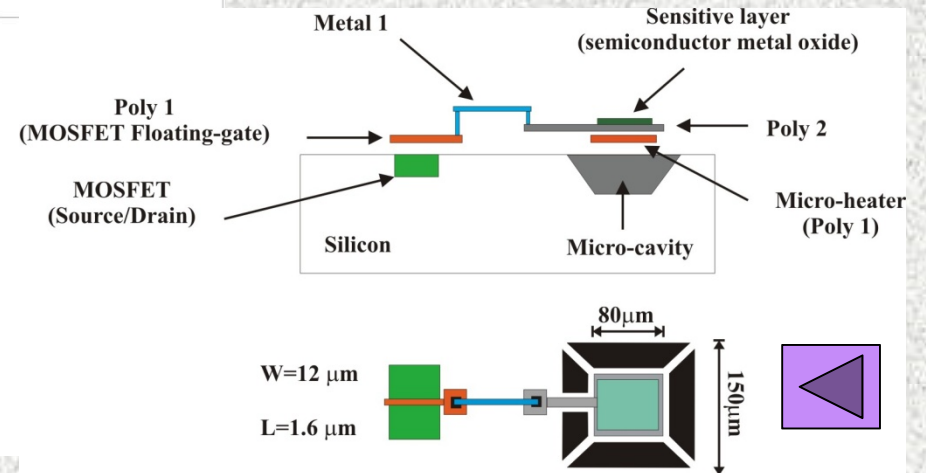
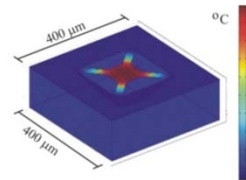
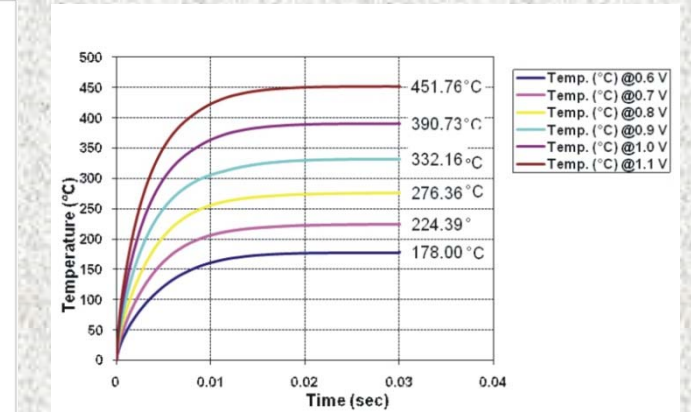
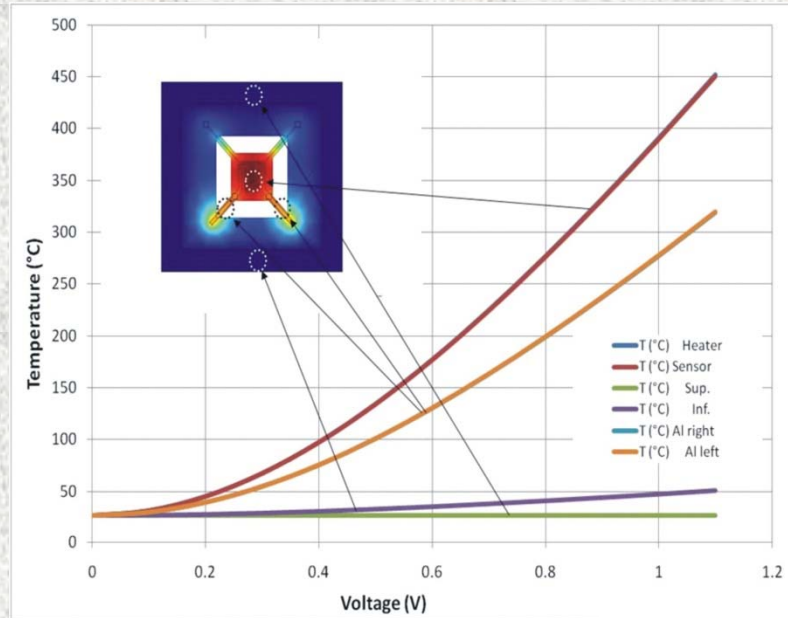




Simulación electro-térmica y diagrama esquemático del sensor

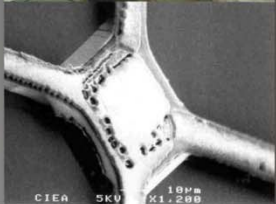
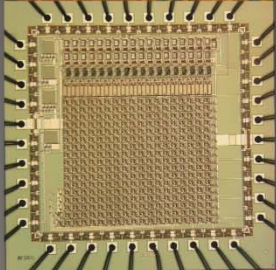
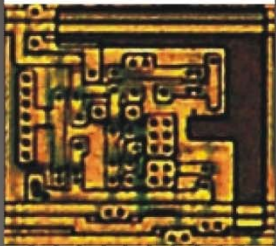


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Cinvestav



CIEA 5KV X1.200 10µm

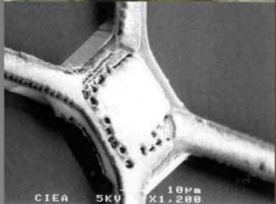
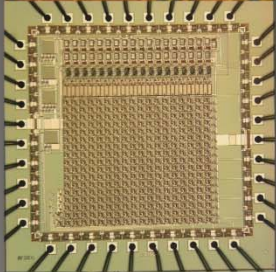
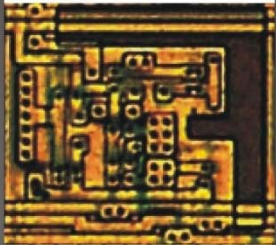
SISTEMAS VLSI

Modelación de biopilas mediante sistemas neurodifusos



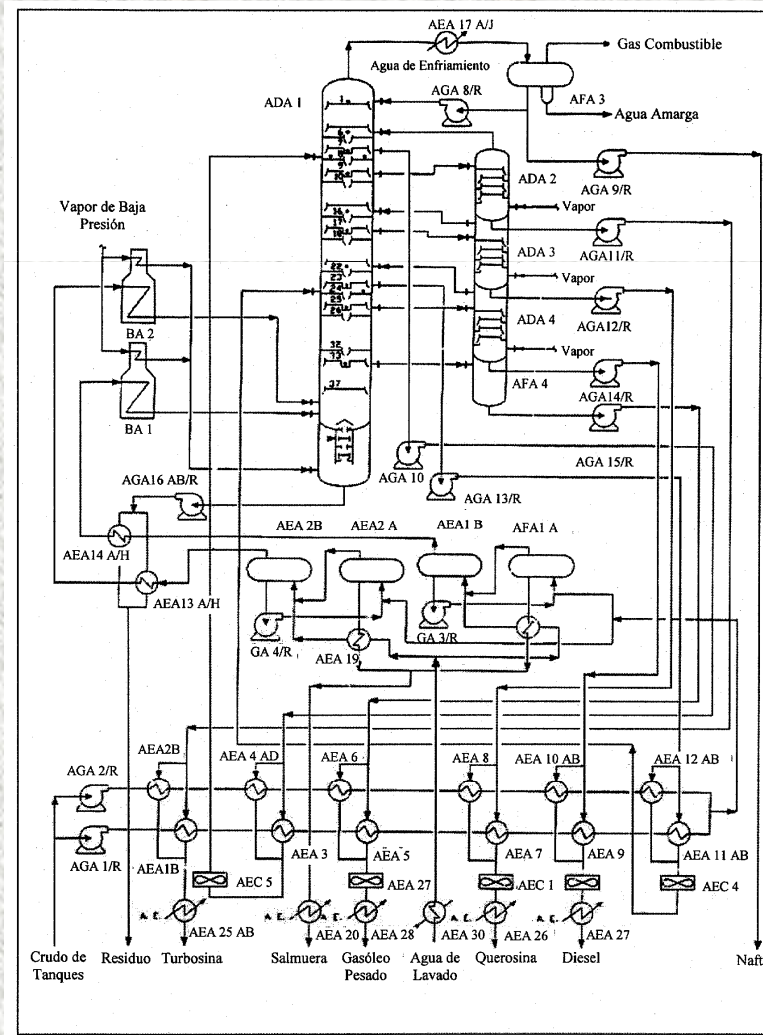


Cinvestav



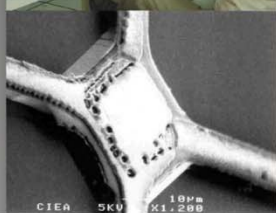
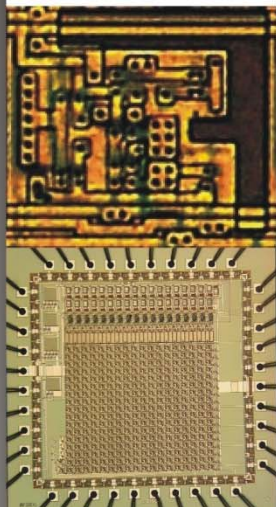
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Unidad de Destilación Atmosférica de Crudo

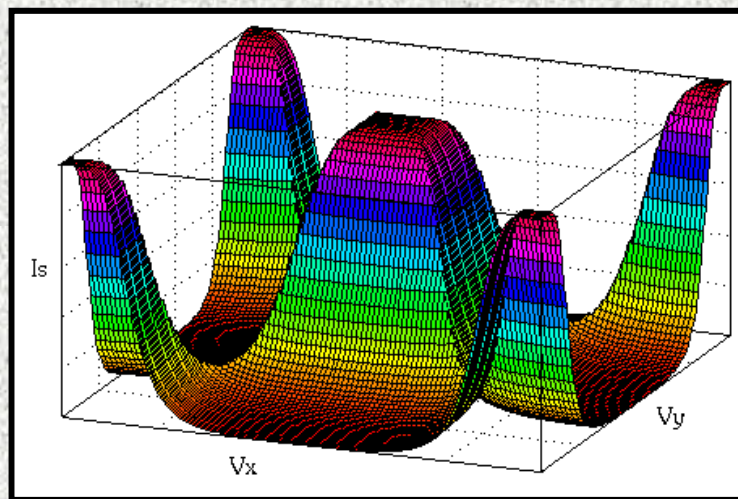
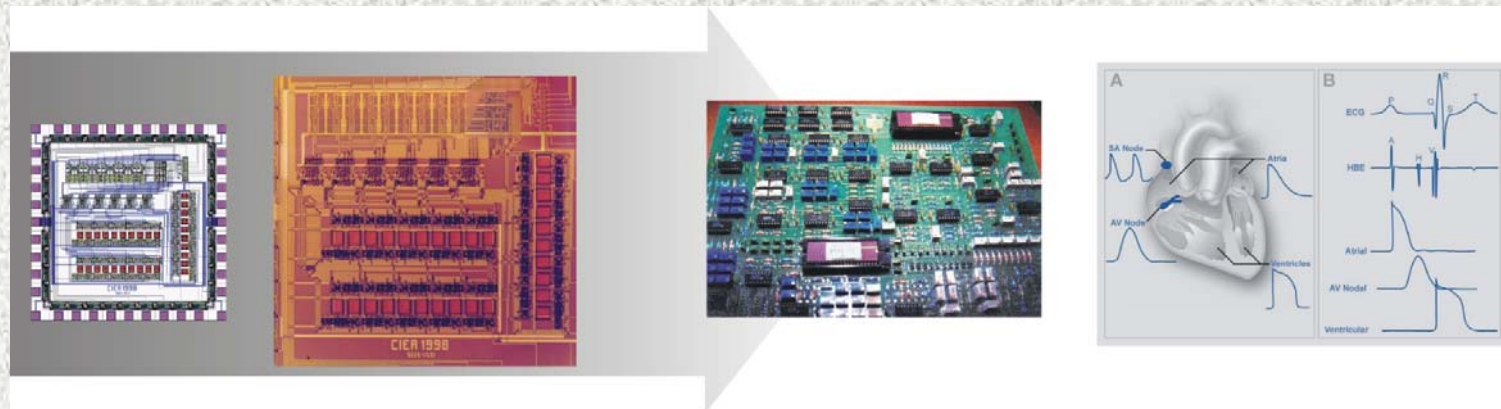




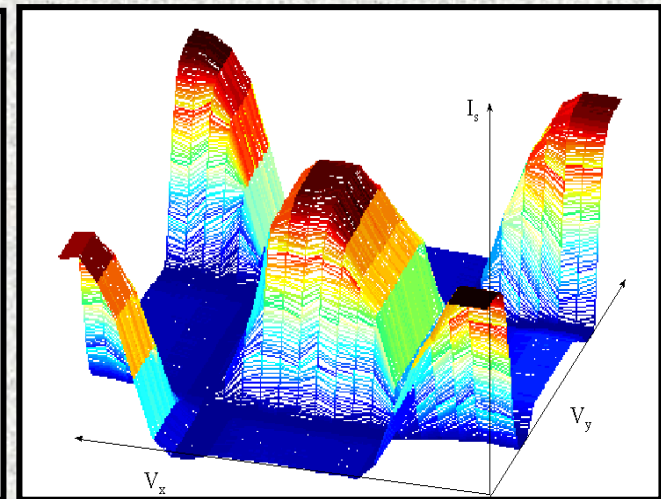
Sistema de Detección de Contracción Ventricular Prematura (PVC) Basado en Redes Neurodifusas



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Resultados teóricos



Resultados experimentales

