

# FIXED INSTRUCTION EXECUTION ERROR PREVENTION SYSTEM ( F I X E R )

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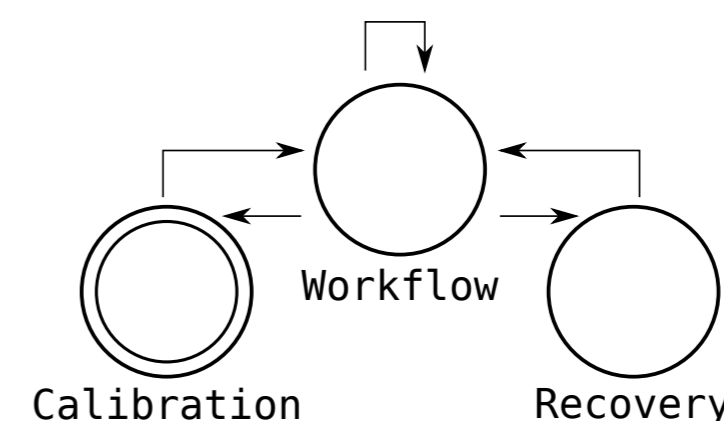
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## Introduction

Fixer solves the problem encountered in manufacturing industry where every error in the process means financial loss. Fixer's algorithm is able to orientate in the operating space by transforming the coordinate system using optical flow and marker tracking. With the ability to know the exact relative position of the tool (for example screwdriver) to the piece being completed Fixer is able to track if the worker is following the predefined manufacturing process. If an anomaly is detected for example the worker spiked a step Fixer immediately shuts down power to the screwdriver and alarms the worker thus the error is actively prevented. This algorithm was developed and tested on videos from real life production environment.

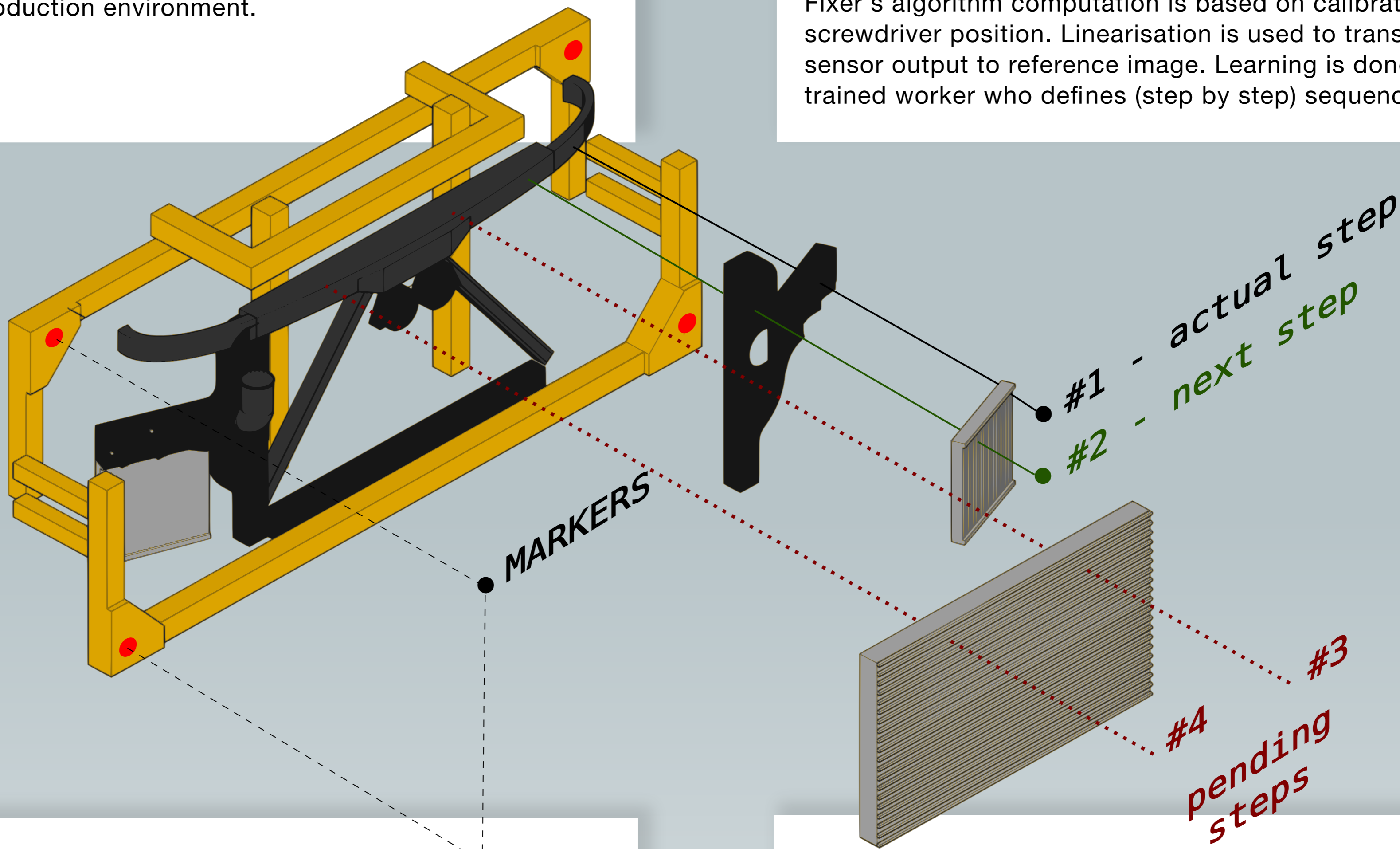
## Evaluation software



Evaluation software consists of:

- 1) stored position sequences for each assembled part
- 2) autonomous processing software

Fixer's algorithm computation is based on calibration markers and screwdriver position. Linearisation is used to transform IR matrix sensor output to reference image. Learning is done manually by trained worker who defines (step by step) sequence pattern.

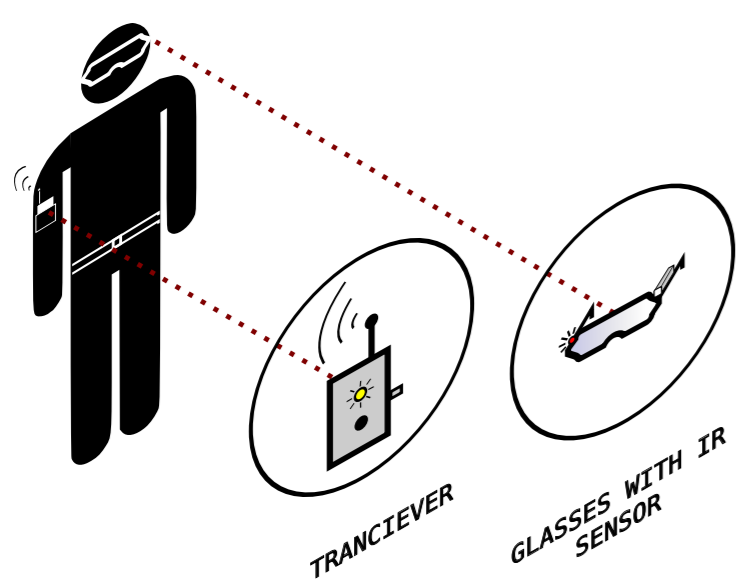


## Hardware Components

We have developed several types of markers - both visible and IR spectrum markers and using both unmodulated and modulated light. Thus we have many possible combination of markers - that can be tweaked to cover any possible situation we might encounter in the industrial usage such as different light conditions, reflective materials, software execution speed etc.

Hardware components of Fixer are:

- markers (reflective or diodes)
- IR matrix sensor with fisheye lense - mounted on protective head gear
- possible integration of ultrasound ranging to enable better depth recognition
- computation processing unit - one per worker, mounted on worker's belt
- battery pack - belt mounted



## Results

From the hardware perspective - we have shown that it is possible to construct an optical filter for the camera lens specifically detecting modulated infra red-diode markers thus removing any possible optical interference. A belt-mounted computation unit was developed and long term performance/stability tested. Pilot software is under development and its first results will be presented as part of the poster exhibition. Next steps will focus on combining our SW and HW elements and tweaking the system in live production environments.