

Intelligent Screwdriver



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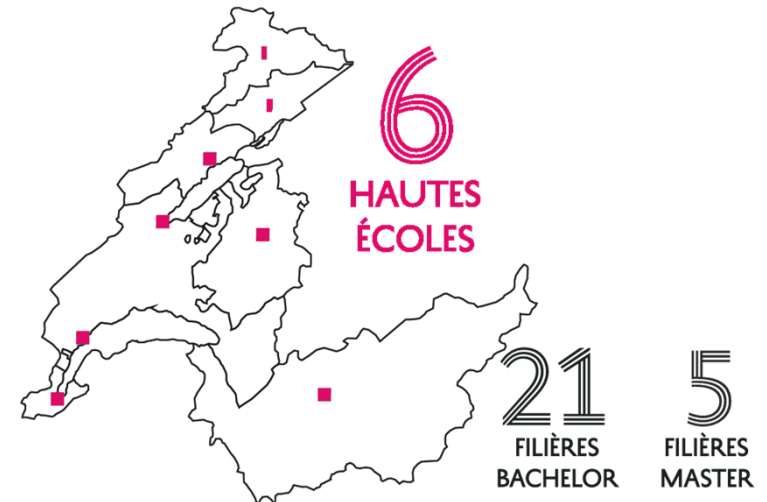
Innosuisse - Swiss Innovation Agency

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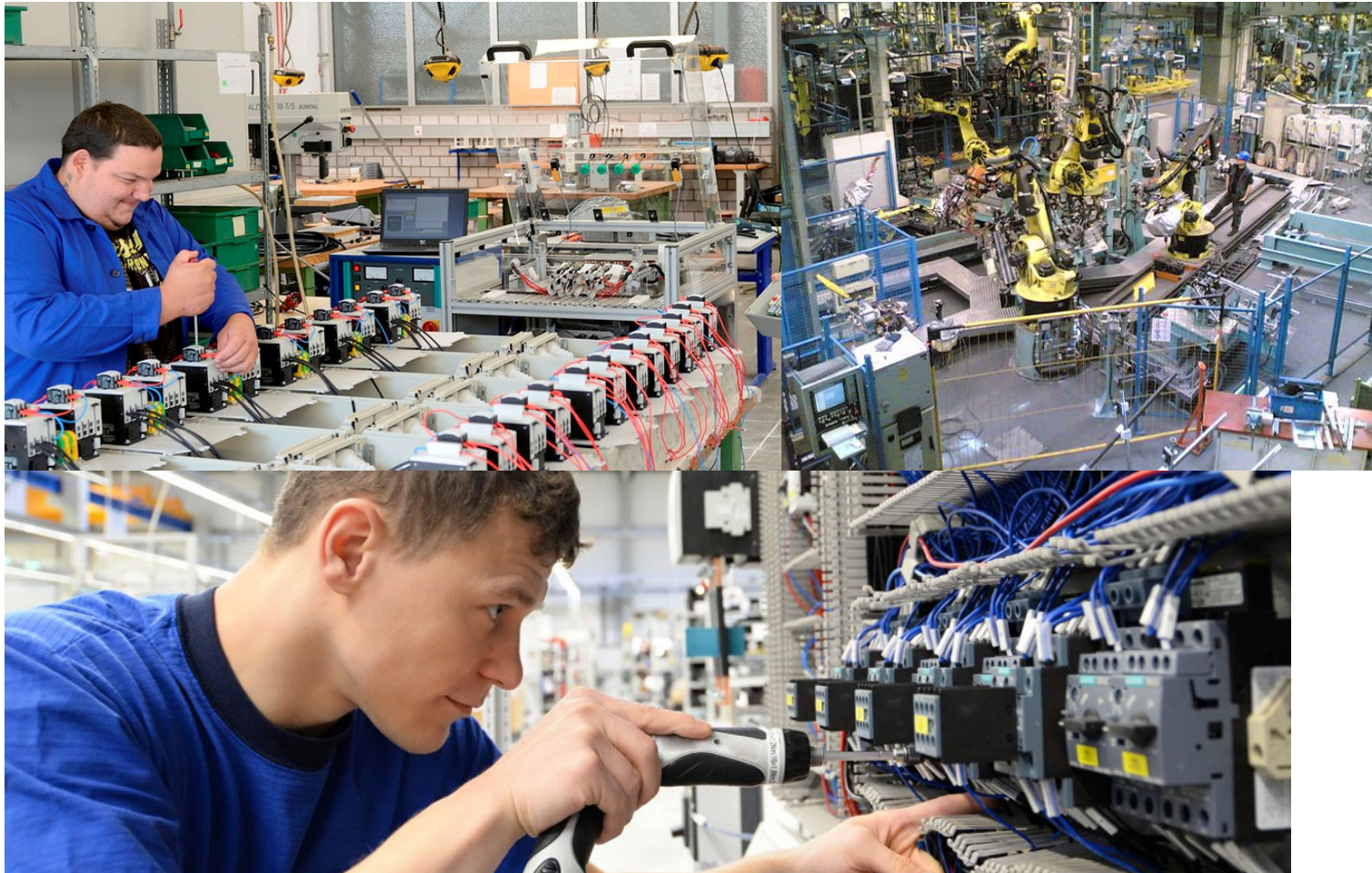


EPHJ
LE MONDE DE LA
HAUTE PRÉCISION

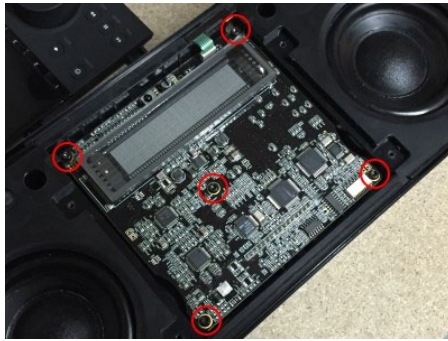
Georg Wälder &
Michel Lauria – hepia (GE)
Christophe Besson - HEIG-VD
Oliver Hüsser - HE-ARC



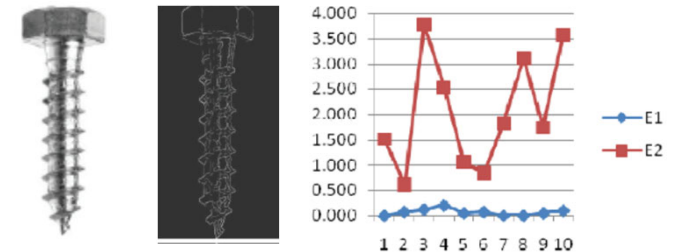
Industrie 4.0



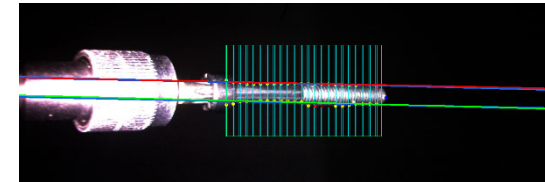
1. Identification de la zone de travail– position de vissage



2. Identification de la vis programmation des paramètres



Diameters, longueurs, filetage, matière...

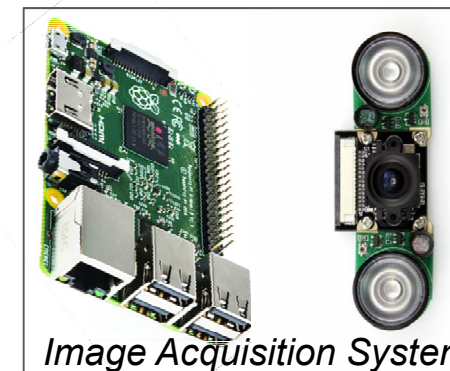


3. Configuration (torque, #tours)



4. Qualité :

Protocol de l'opération: Paramètres, mesures torque, photo & vidéo

[illegible]

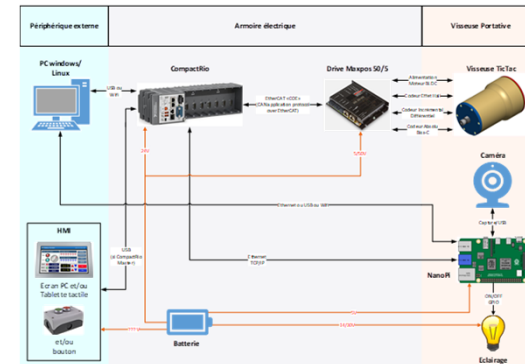
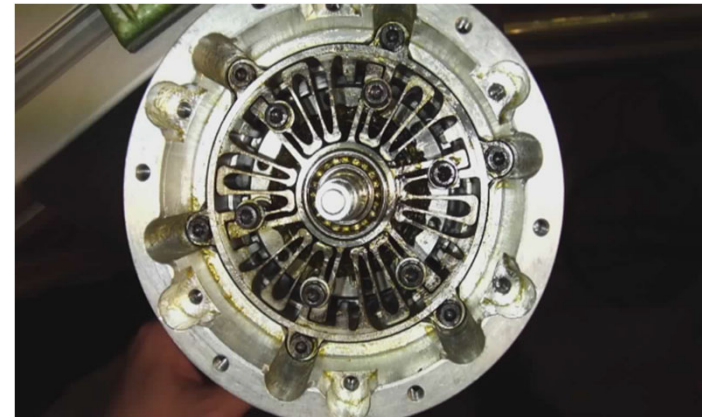
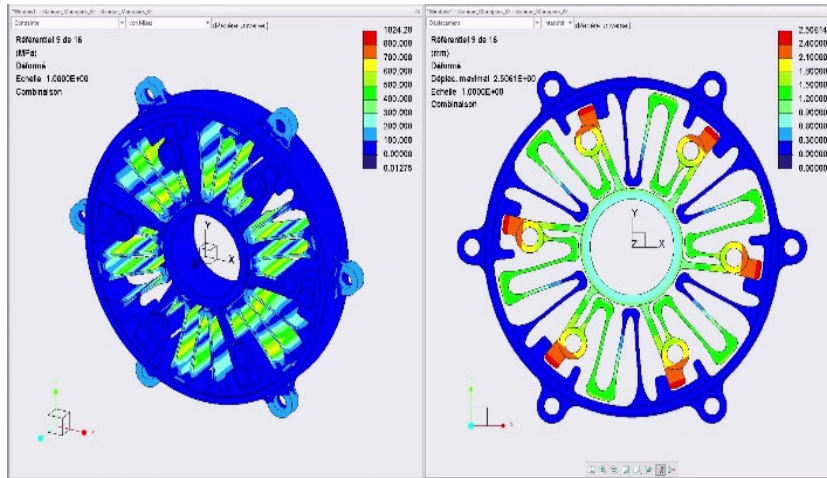
1. Torque transmission & Control: New Clutch concept :

- Mechanical design of clutch :
“wrap-spring”
- Embedded controller: averages screwing torque precision $< 3\%$, and without overdriving
- Screwing speed (for 30 mm long, M6 screw) < 0.5 sec, with screw & place identification ≤ 0.7 sec

2. Vision system & Machine Learning

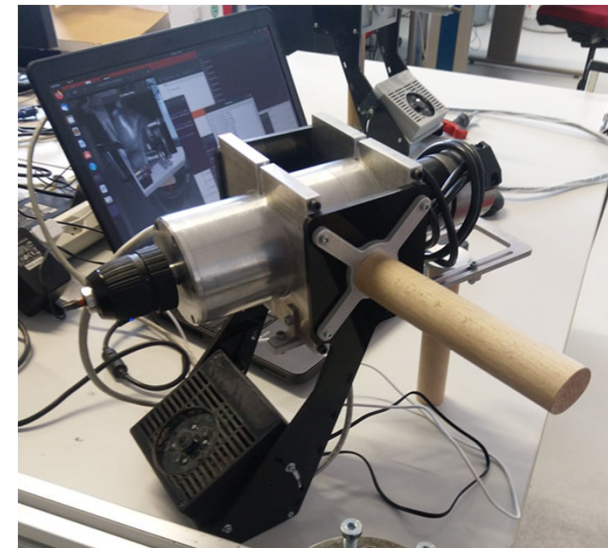
- compact($<200\text{g}$) low-power($<5\text{W}$) prototype vision system (camera, light)
- machine learning – neural networks - able to identify screw model and location with an
- accuracy about 99 %

- Flexible Hinges, Control algorithm

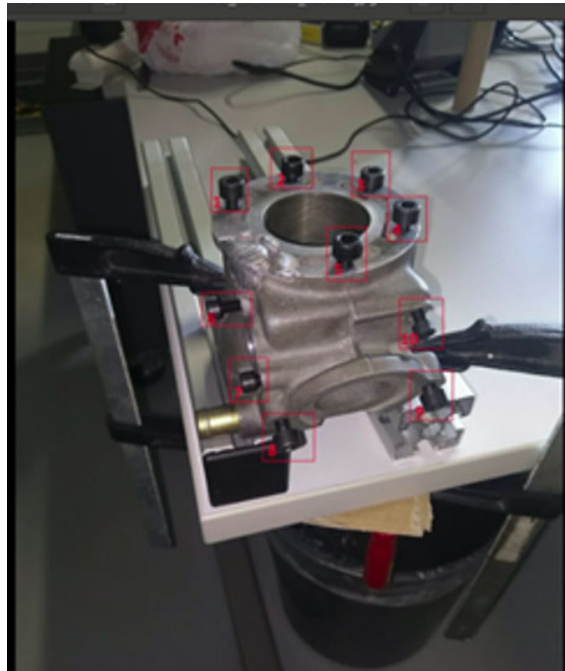


Vision module

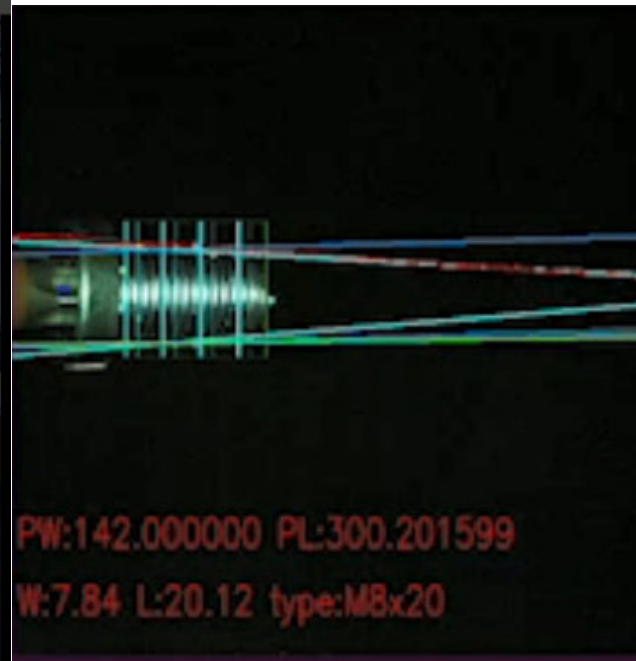
- Prototype (Fabrication additive) :
- vision intégré (camera Basler) & light
- Processor : NanoPi NEO3
- Poids 224g (possible der réduire : suppression Ethernet connecteur , optimiser boite



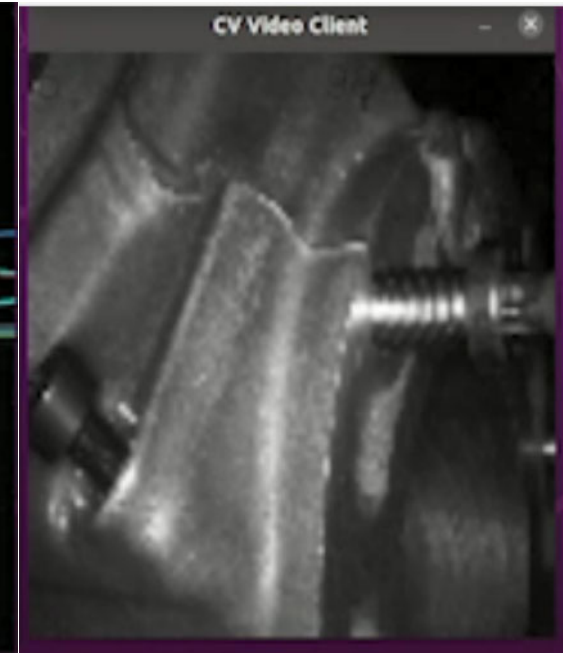
Teach - in



Identification vis

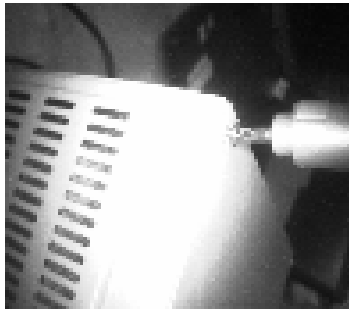


Identification lieu



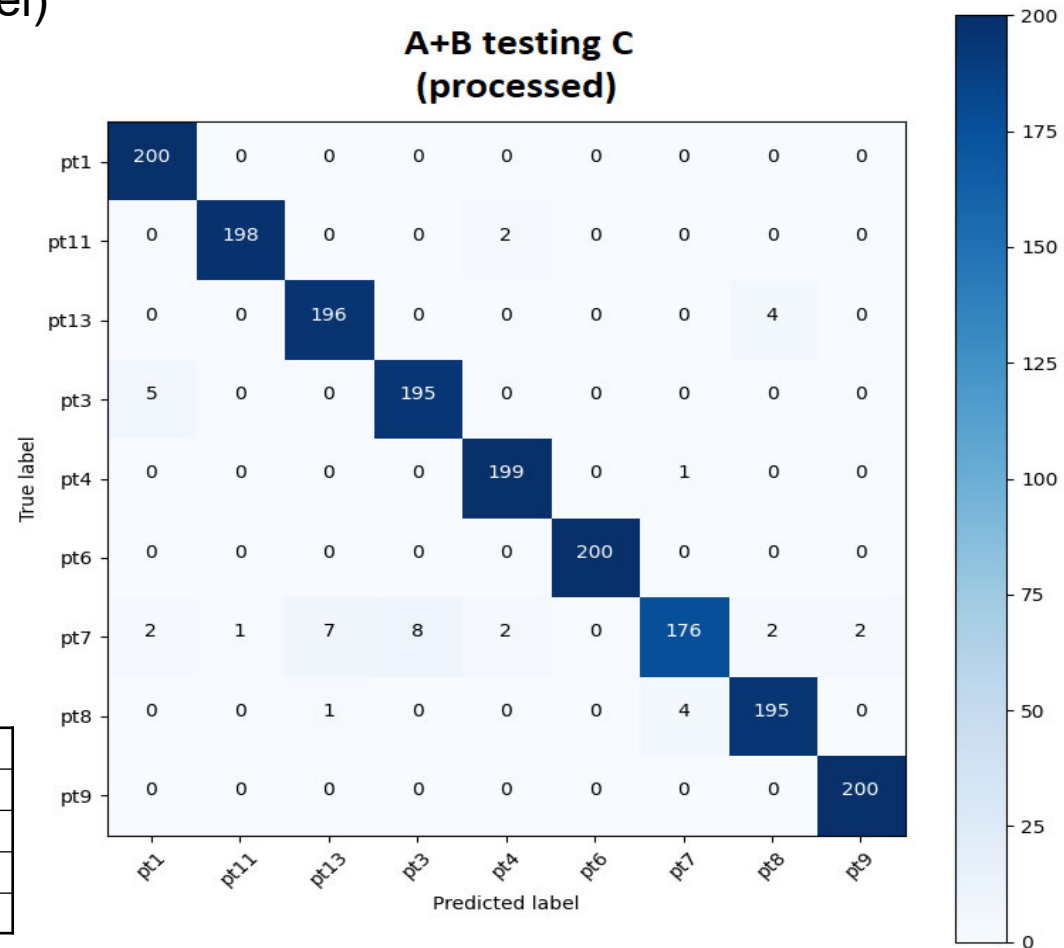
Results : Detection of screwing position @ PC-Box@home

Based on 3 samples A,B,C , combining 2 to make prediction of 3rd
(which not used for model)



f=10mm	A+B test C
Précision (moyenne)	97.70%
Rappel (moyenne)	97.70%
F-mesure (moyenne)	97.60%

With applied correction of histograms
Right positif = 176
False positifs = 1 + 4 = 5
Total positifs = 176 + 5 = 181
Précision = 176/181 = 97.2%



Detection de la position des vis Case 2 & 3 : Motor & valve



- Protocol : Labview => excel

Visseuse TicTac 2

Opérateur:	Operateur	#vis
Date:	24.02.2022	• Longueur
Heure:	15:36	• Diamètre
Vitesse:	400	• Position
Accélération:	1000	• Couple

Prochaines étapes:

Cherche des investisseurs

- Production
- Distribution
- Compléter gamme produit

Recette

NB Vis	TicTac Consigne			
	Diamètre [mm]	Longueur [mm]	Position	Consigne Couple [Nm]
1	8	10	0	3

DEMO: GE-Innovation

Vision

NB Vis	Système de détection					
	Diamètre [mm]	Longueur [mm]	Position	Couple Max [Nm]	Diamètre Absolu [mm]	Longueur Absolu [mm]
1	8	10	0	3	8	100

