

# Metti un robot nella scuola...

Il nostro progetto rappresenta un approccio didattico a problemi industriali: "come ispezionare tubazioni e condotte industriali per ottenere dati tecnici senza rischiosi infortuni". Possiamo quindi immaginare la macchina come un "carrello" che porta gli strumenti necessari per un'esplorazione in un'area a rischio mentre l'operatore si trova a distanza di sicurezza.

## INNOVAZIONE RAGGIUNTA E IMPATTO COMMERCIALE

L'obiettivo che volevamo raggiungere è quello di progettare e realizzare una macchina di piccole dimensioni in grado di muoversi e anche salire all'interno di un tubo. Tutte le tecnologie che abbiamo usato sono già disponibili sul mercato e facilmente accessibili a un contesto scolastico.

## COOPERAZIONE TRA RICERCA E INDUSTRIA CON BENEFICIO PER IL PARTNER

I produttori, che hanno collaborato con il progetto "Robot Inspection", hanno co-sviluppato le componenti principali.

Hanno collaborato con il Polo Tecnico e i suoi studenti, facilitando l'impiego futuro degli ex-studenti nei processi di lavoro.

Le aziende possono beneficiare di un possibile futura commercializzazione del prodotto.

## MOTIVAZIONE, OBIETTIVI DELLO SFORZO DI RICERCA E SVILUPPO

Il Polo Tecnico Professionale Industriale è una scuola tecnica e professionale di eccellenza, membro della Rete di Scuole Italiane coordinata dalla [Scuola di Robotica di Genova](#).

Al fine di perseguire i principi sui quali si fonda la Scuola di Robotica, gli studenti sono motivati a studiare e costruire nuove macchine per "gioco" seguendo il principio del "learning-by-play". La robotica è stata scelta perché consente di avvicinarsi a varie tecnologie e di acquisire conoscenze sullo stato dell'arte delle macchine intelligenti. Inoltre, gli studenti lavorano in team e collaborano con industrie del territorio per promuovere l'interazione scuola-industria.

La Scuola di Robotica è un'associazione impegnata nello sviluppo e nell'applicazione di prodotti di robotica per la nostra società.

Per compiere la sua missione, la Scuola di Robotica promuove la robotica educativa nelle Scuole.

Per questo motivo, ha sviluppato e gestisce una rete di scuole impegnate nell'introduzione della robotica.

## PER APPROFONDIRE:

[Progetto Robot di Ispezione ad azionamento elettrico](#). Studio della cinematica di un robot d'ispezione tubi con moto d'avanzamento elicoidale.

\*\*\*

## ENGLISH VERSION

The paper presents an original robot architecture for in-pipe inspection. The robot consists of two parts articulated with a flexible joint. One part is guided along the pipe by a set of wheels moving parallel to the axis of the

pipe, while the other part is forced to follow the first one in an helical motion thanks to tilted wheels rotating around the axis of the pipe. A single motor is placed between the two bodies to produce the motion. All the wheels are mounted on a suspension to accommodate for changing in diameter and curves in the pipe.

This Inspection robot was developed especially for use in pipelines. It can move like a screw, so it manages all changes in direction, whether upwards or downwards. The wheels are pneumatically pressed against the interior walls of the pipeline, depending on the type motion.

The robot is autonomous and carries its own batteries and radio link. Four different prototypes have been constructed for pipe diameters of 150, 250 mm, respectively. This architecture is very simple and the rotary motion can be exploited to carry out scrubbing or inspection tasks.

IGUS products of different categories are used for this purpose: iglidur and igubal bearings as well the Triflex R energy chain. Flexible Chain "TRIFLEX", whose suppleness and design particularly impressed us, it is used as a flexible joint to link the two parts of the robot. The chain shape and structure inspired us to think to use it as the "spine" of the robot. The machine is able to move inside a tube and it's powered by an electric motor. Its specifics are: weight (3kg), length (500mm), width (150-250mm). Phoenix Contact PLC's and I/O wireless module will provide the control of the machine.

– Project "[Climbing Inspection Robot with Helical motion Xplore 2012](#)" (Youtube movies)

This robot can be defined as an evolution in terms of mechanics and drive of the unlucky prototype presented at the 2008 Xplore edition (even if it is made of the same parts and technologies by [German IGUS](#) and PHOENIX CONTACT), which nevertheless has demonstrated its potential during some other National and International contests between technical schools: Concorso internazionale CAD 3D Autodesk 2009, Olimpiadi di Automazione Siemens 2009, Concorso ADM 2009 CAD 3D.

– Project "[Worm Robot with Compressed Air Xplore 2008](#)" (Youtube movies)

in collaboration with Robotic Association [School of Robotics](#) located in Genova, Italy.

School of Robotics is an association committed to the development and application of Robotics products for our society. It promotes the virtuous circle research/education/useful robotics products/society. To fulfil its mission, School of Robotics promotes robotics as subject and educational technology (educational Robotics) from primary school on. For this reason, it has developed and manages a network of schools committed to the introduction of robotics (as subject and educational technology) in all the school rankings, from primary school to pre graduate.

The Polo Tecnico Professionale Industriale is a Technical and Vocational School of excellence, member of the Italian School network managed by School of Robotics.

## MOTIVATION, GOALS OF THE RESEARCH AND DEVELOPMENT EFFORT

In order to follow the principles on which the School of Robotics is founded, students in our high school are motivated and helped in thinking and developing new machines as in the principle of "learning-by-playing". So this projects starts on the idea of learning new technologies and acquire knowledge of the state of art machines, moreover students work in a team that collaborate with some industries on the local area to promote school-industry interaction.

## STATE OF THE ART

Some other interesting project on which we started our one:

[http://www.romela.org/main/CIRCA:\\_Climbing\\_Inspection\\_Robot\\_with\\_Compressed\\_Air](http://www.romela.org/main/CIRCA:_Climbing_Inspection_Robot_with_Compressed_Air)

<http://basicrobot.blogspot.com/2009/03/pipe-inspection-robot-3.html>

## PROJECT APPROACH

Our project truly represents a didactical way to approach an industrial deal which is to inspect tubes and pipeline to get technical data without risk injuries or death of workers. We can almost imagine the machine like a "cart" having the aim to carry all the tools you need during your exploration and analysis.

## ACHIEVED INNOVATION AND COMMERCIAL IMPACT

The goal we wanted to and we succeed in achieving is to design and realize a small and tiny machine able to move and even climb up inside a tube. All the technologies we used were already available on the market and that's why we managed to cut down on both the costs of development and manufacture.

## COOPERATION BETWEEN RESEARCH AND INDUSTRY WITH BENEFIT FOR THE PARTNERS

The manufacturers, which have cooperated with the PROJECT Climbing Inspection Robot, have co-developed the main components. They have cooperated with the Polo Tecnico and its students, easing the future employments of former students into working processes. They can benefit of possible future marketing of the product.

\*\*\*

L'I.S.I.S.S. Polo Tecnico Professionale Industriale ITIS"Augusto Righi" di Treviglio fa parte del progetto Pinocchio2.0:

<http://blog.edidablog.it/blogs//index.php?blog=275> e

<http://www.facebook.com/group.php?gid=139204519436108>

\*\*\*

## ARTICOLI CORRELATI

- [Geppetto, Pinocchio e i loro compagni di viaggio](#)
- [Baby-flash](#)
- [Robotica e narrazione](#)

- [Dagli automi a Pinocchio 2.0: una rivalutazione in chiave didattica della saga dei non-nati](#)
- [“Raccontare i robot” 2011: al servizio degli umani](#)
- [È ancora attuale Pinocchio?](#)
- [Pinocchio 3000 e il biovitalismo](#)
- [Matite digitali](#)
- [Le Fiabe Sonore](#)
- [Robotica Creativa in ospedale](#)
- [Costruisco un Sapientino... sulla storia di Pinocchio](#)
- [La robotica nella mia tesina di terza media](#)
- [Bambina e la fatina computerina](#)
- [La trasformazione educativa in Pinocchio di Collodi](#)
- [Che fatica essere Pinocchio!](#)

Donato Mazzei e Isabella Benedetti