fast, flexible technology
Robotics
challenges:

• H-R Interaction
• safety for Humans
• safety for Robots
• energy efficiency
• dealing with unstructured environments

... toward solution:

soft robotics

dreaming it possible
qbmove

• The Natural Motion™ actuator (VSA) you can download and build yourself
• Three versions (completely Open SW/HW):
  • Maker, Maker-pro, Advanced
• Easy control interface:
  • Use like a servomotor
  • Control mechanical equilibrium position and stiffness
  • Seamless integration in C, Simulink, ROS
• On-board sensors read, control and transmit internal configuration data and position of the output shaft
qbmove: faster than you’d think

- Elasticity in an actuator can be used to increase the dynamic range of the actuator output – in this example, to repeatedly punch and cut a leather sheet.

- The application (cutting a thick leather sheet) call for higher velocities than the motor could provide.

- Here we fix inertia and stiffness value, and shape the equilibrium point input to oscillate the blade at resonant frequency.
We are not cutting yet.
People are not stiff while hammering a nail:

- reduce the musculoskeletal stress
- allow tool velocity to increase beyond that of voluntary movements
- use energy storage and release to increase efficiency
qbmove hammer:
strong & robust
qbmoves are building blocks

- *qbmoves* are modular and easy to combine
- can be combined to build *qbmates*: imagination is the limit!

Examples:
- a *qbmate* snake
- ...hexapod
- ...biped
- ...or torso
natural motion initiative

...spreading soft actuation for robots that move like you...

Nobody knows exactly how robots of the future will look. However, many think they will not be like the heavy, bulky, rigid machines dangerously moving around in old-fashioned industrial plants. Robots of the next generation will be physically compliant and tangible machines that can interact with and affectively help humans, in other words... just like muscles.

Just like muscles, Natural Motion initiators see control their equilibrium point AND alignment.

This latest community tool is built, maintained, and used by researchers, industrial partners and enthusiasts that support the philosophy of a joint and open development of Natural Motion.

You're welcome to come and get to know more about the initiative at http://naturalmotioninitiative.org/

Forget about jerky jacks... You don't have to pay for sophisticated, fragile force control either.

Natural Motion is "the third way" of robotics: simple, affordable, yet smooth, strong, and accurate.

Everybody wants to know how robots will move in the future. Natural Motion is your chance to really have an impact! (If you want)}
qbmove & qbmate

• development is promoted by the European project SAPHARI www.saphari.eu

• all design (hardware, electronics, software, etc..) are open and free to download and replicate from: www.naturalmotioninitiative.com

• ready-made qbmove units and qbmate kits from: www.qbrobotics.com
qbmove

- Maker
- Maker-pro
- Advanced

<table>
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<tr>
<th>QB Move</th>
<th>Standard</th>
<th>Developer*</th>
<th>Availability</th>
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<tr>
<td>QB Move Maker</td>
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### qbmate

- Starter kit
- Full kit
- Advanced kit

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<th>Kit</th>
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<td>competition teams</td>
<td>research institutes</td>
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<tr>
<td>$26.9M/year</td>
<td>€100M+ of investments</td>
<td>$ 9.526 billion/year</td>
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<td>founded in 2005</td>
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<td>€23.3M€</td>
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market analysis | big companies...
Break even point

- Our analysis gives a 120K€ BEP on a 3Y projection
- Corresponds (roughly) to 0.3% of a market volume of 40M€
- At the present stage, most of it covered with our current SAPHARI-related commission

But... is this all? ...of course not!
LOOK AT THE FULL LANDSCAPE
Robot Intelligence

- **Yesterday:** Puma
  - Motorola 68K
  - 8 MHz
  - 160 Kflops

- **Today:** smartphones
  - Snapdragon S4
  - 1.5 GHz
  - 6.4 Gflops
Robot Motion

- 1960’s robotics
  - Unimate Puma
  - Servomotors

- 2010’s robotics
  - Servomotors
True Goal of qb robotics

- To bring the advantages of natural motion in the light of the sun
- Natural motion technology will lead to a new generation of high-performance, adaptable and flexible manufacturing robots
- … and will pave the way to service robotics
- Natural motion is going to be the next paradigm shift in robotics
- Our freshly granted patent (EU, soon US) covers natural motion servomotors
Mid and long term goals

- **Mid term:** spread natural motion and foster research, in order to shorten the time before its industrial application.
- Meanwhile, upgrade the technology readiness level of natural motion.
- **Long term:** sell (or license) natural motion technology to manufactory and service robotics as a component provider.

[Market Size Chart]

Source: Japan Robotics Association

*Excludes Low Level Electronic Toys*
fast, flexible technology