Improvement of the charging board for the shot mechanism of an autonomous soccer robot

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Motivation and Goals

- more reliable circuit
 - a lot of problems with communication or broken parts
- galvanic isolation
 - greater safty for people
- modular and flexible
 - reduce effort if there's a need to change the charging voltage or speed
- better regulated charging voltage
 - repeatability of the flight curve and range of the ball
- improvement of energy efficiency
 - save energy to use smaller batteries

Improvement of Charging Board



Old Circuit Board





Scheme of old Circuit Board





Prototyp of new Circuit Board





Scheme of new Circuit Board





Technical Data

	old charging board	new charging board
U _{in}	24 V	24 V
Ī _{in}	1,35 A	up to 5 A
J _{charge}	330 V	up to 450 V
Γ_{charge}	16 s	under 5 s
length	160 mm	160 mm
width	100 mm	100 mm
height	40 mm	35 mm



Adjustable Components



input current



charging voltage



Advantages

- more precise charging voltage
- galvanic isolation
 - seperated circuit with 330 V
 - no current flow to secondary side if a part is broken
 - greater safety for people
- communication via CAN-Bus or Ethernet
- easily to integrate in other robots
 - adjustable consumption of current
 - adjustable output voltage



Disadvantages

- more complex design
 - more space needed for all parts
 - more difficult troubleshooting
- less energy efficient

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$$U_{in} = 26, 6 V, U_{charge} = 330 V, T_{charge} = 16 s$$

• new:
$$\eta = 71\%$$

$$\circ$$
 old: $\eta = 78\%$



Future Work

- change layout to use small pluggable boards
 - to adjust input current
 - to adjust charging voltage
- implement communication via ethernet in software
- test voltages up to 450 V with different charging speeds



Get Layout and Software

- software and pcb layout can be downloaded from GitHub
- https://git.io/v1IKV
 - rekick2016-Flyback-Prototyp-Final.brd



Thank you for your attention.

Questions are welcome.

Supported by:



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Technical Data

	old charging circuit	new charging circuit
MCU	ATmega128	ATmega16M1
Speed	16 MHz	16 MHz
CAN	\checkmark	\checkmark
Ethernet	-	\checkmark
η	78%	71%