Roadmap
Current status and upcoming changes

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Introduction
Short term: upcoming changes
Long term: event-triggered roadmap

Motivations for starting on a new basis

Objectives

- Make link between scientific challenges and roadmap explicit
- Ensure that rules evolve along with robot capabilities
- Allow teams to plan their development
- Create a maintainable document

Status and validation process

- Current document (1st version, June 13th 2019)
    - For trustees: presented, no complains, but no formal answer
    - For the league: released but not presented, not voted upon
- Future updates
    - Vote on modifications (similar to rulebook)

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Structure of the new roadmap

Scientific challenges

- Scientific context of the league
- Research contributions from the league
- Require a major update every 4 years

Short-Term: Upcoming changes

- Changes planned for the next 5 years

Long-term: event-triggered roadmap

- What are the remaining steps to win against humans?
- Metrics: how are improvements and performance measured
- Criteria required to take significant steps

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Implemented for 2020

- Structural changes to the league
  - TeenSize now plays in Kid and Adult
  - Division A/B
  - Combined teams
- Autonomous placement for all robots
- Humanoid Research Demonstration
- Technical Challenges
  - Kid: push-recovery $\rightarrow$ blindfolded robot challenge
  - High jump $\rightarrow$ Parkour challenge

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Initially planned for 2020, but canceled

No implementation agreement in time

- Humanoid Open Competition
  - Discussed on Sunday June 28th, at 9:30am CEST

Voted out by the league

- Kick from moving ball: pass need to be performed by a robot
- Adult: push-recovery $\rightarrow$ standing-up

Discussion: How do we manage the upcoming changes?

- Mandatory league vote before adding something
- Can we revote on something that has been announced

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Planned for 2021

- Being more explicit on network requirements
  - WiFi quality: minimal bandwidth, anywhere on the field
- Enforcing the rules more strictly
  - Monitoring bandwidth of each team
  - Robots not in play should not be able to send messages
- Discussion:
  - Should we postpone this change to 2021
  - Require significant development (any volunteer)
  - Risk that we set rules which can not be applied

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Discussion: Height limits

- Concerns expressed
    - Adult: Lowering min height is taking a step back
    - Kid: Having 40cm and 1.2m high robots in the same league is difficult
- This rule has major impact on both leagues, how can we vote on that?
    - More teams in Kid: unfair for Adult

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Discussion: Next major update

- 2023 or 2024?
- What content?

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Metrics

Motion metrics

Peak speed, ball approach duration, Kick properties (distance, accuracy, ...)

Perception metrics

Ball-localization, self-localization, opponent recognition

Gameplay metrics

Shots on goal, diving saves, nb robots on fields, Don't Mess Up Period (DMUP)

Requirements

Compare **ground truth** (labeled video) with **robots prediction** (common protocol).

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About criteria and rule implementation

Shared success

At least **3 teams** need to fit a criterion to consider that the step is completed.

Time to plan for participants and LOC

When a step is completed, the associated change is triggered **two years later**.

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Field dimensions and number of robots

Evolution planned

Robots	Kid			Adult		
2	4.5	$\times$	3	**14**	$\times$	**9**
3	6	$\times$	4	21	$\times$	14
4	**9**	$\times$	**6**	32	$\times$	21
6	14	$\times$	9	43	$\times$	32
8	21	$\times$	14	65	$\times$	43
11	32	$\times$	21	105	$\times$	70

When is size increased?

- Peak speed: 20s to cross the field.
- Kick distance: at least half a field.

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Discussion: Outdoor?

- Critical to increase field dimensions and number of players
- Gradual steps
  - Outdoor with a roof first
- Moving from artificial turf to real grass? Is it necessary?
- When/how can we plan it?
  - Include preliminary testing through technical challenges?

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Handlers and game duration

Adult: path to remove the handlers

1. TC: Stand-Up (less than 10 seconds)
2. TC: Falling on hard ground

Once robot can properly fall and stand-up, handlers will be removed

Towards autonomy

- Once DMUP > 3 min: harsher penalties for pick-up and service
- When DMUP $> \frac{\text{halfTimeDuration}}{2}$: increase half time duration:
  - Steps: 15, 20, 30, 45 minutes.

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Gameplay rules

Mandatory throw-in

- Throw-in takes less than 10 seconds to be performed
- Ball cross at least quarter of field length, before stopping

Offside rule

- Satisfying self and opponent localization (RMSE $< \frac{\text{fieldLength}}{50}$)
- At least 6 robots per team