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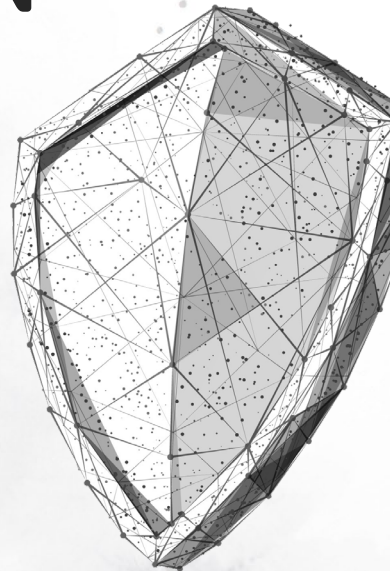
Wir schützen Erfolg!

K.I.E.Z. FIRESIDE-CHAT: PATENT LAW, IP AND COPYRIGHT IN AN AI DRIVEN CONTEXT

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German and European Patent Attorney

Computer Scientist



OVERVIEW

- What am I?
- Motivation: Statistics
- What is a Patent?
- The Invention Process
- Patents for Software and AI

ABOUT ME

- Patent Attorneys in Germany since 1900: “Technology and Law”
- Specialized Attorney for Intellectual Property
- About me:
 - Technical degree: Computer Science (Diplom-Informatik) – LMU München
 - Practical experience in the technical field
 - 3 years apprenticeship with a Patent Attorney
 - Degree in “Law for Patent Attorneys”
 - In the field of intellectual property since 2007
- Number of Patent Attorneys at the end of 2020:
 - European Patent Attorneys: 12.703 (thereof 4.813 Germans)
 - German Patent Attorneys: 4.022 (thereof about 40 – 50 Computer Scientists / Informaticists)

STATISTICS 2020 – ALL TECHNOLOGIES

EPA	Total applications	180 250 (EP + EP phase)	1. Medical technology	14 295
	From Germany	25 954 (2. – US 1st)	2. Digital communication	14 122
	Granted Patents	133 715	3. Computer technology	13 097

DPMA	Total applications	62 105 (DE + DE phase)	1. Transport (mechanical engineering)	10 758
	From Germany	42 249 (26 026 BW+BY)	2. Electrical machines, devices, energy (electrical engineering)	6 992
	Granted Patents	17 305	5. Computer engineering (electrical engineering)	3 080



PUBLISHED “AI” APPLICATIONS @ EPO

Year	# Applications
2010	106
2011	95
2012	111
2013	157
2014	140
2015	185
2016	271
2017	339
2018	568
2019	992
2020	1912

#	Applicants of „AI“ 2016 – 2020	# app.
1	Google	266
2	Samsung Group	187
3	Microsoft Technology Licensing LLC	170
4	Intel Corporation	140
5	Siemens Group	140
6	DeepMind Technologies Limited	91
7	Cambricon Technologies Group	90
8	Fujitsu Limited	81
9	Qualcomm Incorporated	81
10	Huawei Technologies Co. Ltd.	68
11	StradVision, Inc.	67
12	Sony Group	61
13	Robert Bosch GmbH	58
14	Accenture Global Group	46
15	Nokia Group	44
16	Tata Consultancy Services Limited	41
17	Koninklijke Philips N.V.	39
18	Baidu Group	37
19	HRL Laboratories LLC	32
20	Commissariat à l'Energie Atomique et aux Energies Alternatives	31

WHAT IS A PATENT

- ⌘ Technical IP right
- ⌘ Technical solution of a technical problem
- ⌘ What can be patented?
“subject matter” must have:
 - ⌘ novelty
 - ⌘ Inventive step
 - ⌘ industrial application
 - ⌘ (technical character)



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 (43) Offenlegungstag: –
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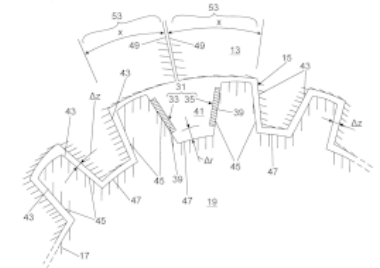
(51) Int Cl.: **F16D 23/06** (2006.01)
 F16H 55/18 (2006.01)

Innerhalb von neun Monaten nach Veröffentlichung der Patenterteilung kann nach § 59 Patentgesetz gegen das Patent Einspruch erhoben werden. Der Einspruch ist schriftlich zu erklären und zu begründen. Innerhalb der Einspruchsfrist ist eine Einspruchsgebühr in Höhe von 200 Euro zu entrichten (§ 6 Patentkostengesetz in Verbindung mit der Anlage zu § 2 Abs. 1 Patentkostengesetz).

(73) Patentinhaber: AUDI AG, 85057 Ingolstadt, DE	(56) Ermittelter Stand der Technik:
(72) Erfinder: Kiesewetter, Jürgen, 91781 Weißenburg, DE	DE 195 45 519 B4 DE 10 2014 213 133 B4 DE 44 26 678 A1 DE 10 2006 044 446 A1 DE 10 2007 059 843 A1

(54) Bezeichnung: **Gangschaltkupplung für ein Fahrzeuggetriebe**

(57) Zusammenfassung: Die Erfindung betrifft eine Gangschaltkupplung für ein Fahrzeuggetriebe, mit einer Getriebewelle (3) mit einem wellenfesten Synchronkörper (9), auf dessen Außenverzahnung (11) eine Schiebemuffe (13) mit ihrer Innenverzahnung (15) axial geführt ist, wobei die Schiebemuffe (13) in einem Schaltzustand in einer Axialbewegung in Zahneingriff mit einer Außenverzahnung (17) eines Loszahnrad (5, 7) gebracht sind, um eine Drehmomentübertragung zwischen der Getriebewelle (3) und dem Loszahnrad (5, 7) herzustellen, und wobei der Zahneingriff zwischen der Schiebemuffen-Innenverzahnung (15) und der Loszahnrad-Außenverzahnung (17) spielbehaftet ist, und zwar mit einem Zahnflankenspiel (Δz), und wobei bei der Drehmomentübertragung die einander zugewandten Zahnflanken (43, 45) der Innenverzahnung (15) der Schiebemuffe (13) und der Außenverzahnung (17) des Loszahnrad (5, 7) unter Aufbrauch des Drehspiels (Δz) miteinander in Anschlag kommen. Erfindungsgemäß wirkt zwischen der Schiebemuffe (13) und dem Loszahnrad (5, 7) zumindest eine Dämpfungsfeder (31), mittels der eine Anschlagbewegung der einander zugewandten Zahnflanken (43, 45) gedämpft wird.



*“IT’S NOT ENOUGH TO INVENT
SOMETHING, ONE ALSO HAS TO REALIZE
THAT THEY’VE INVENTED SOMETHING.”*

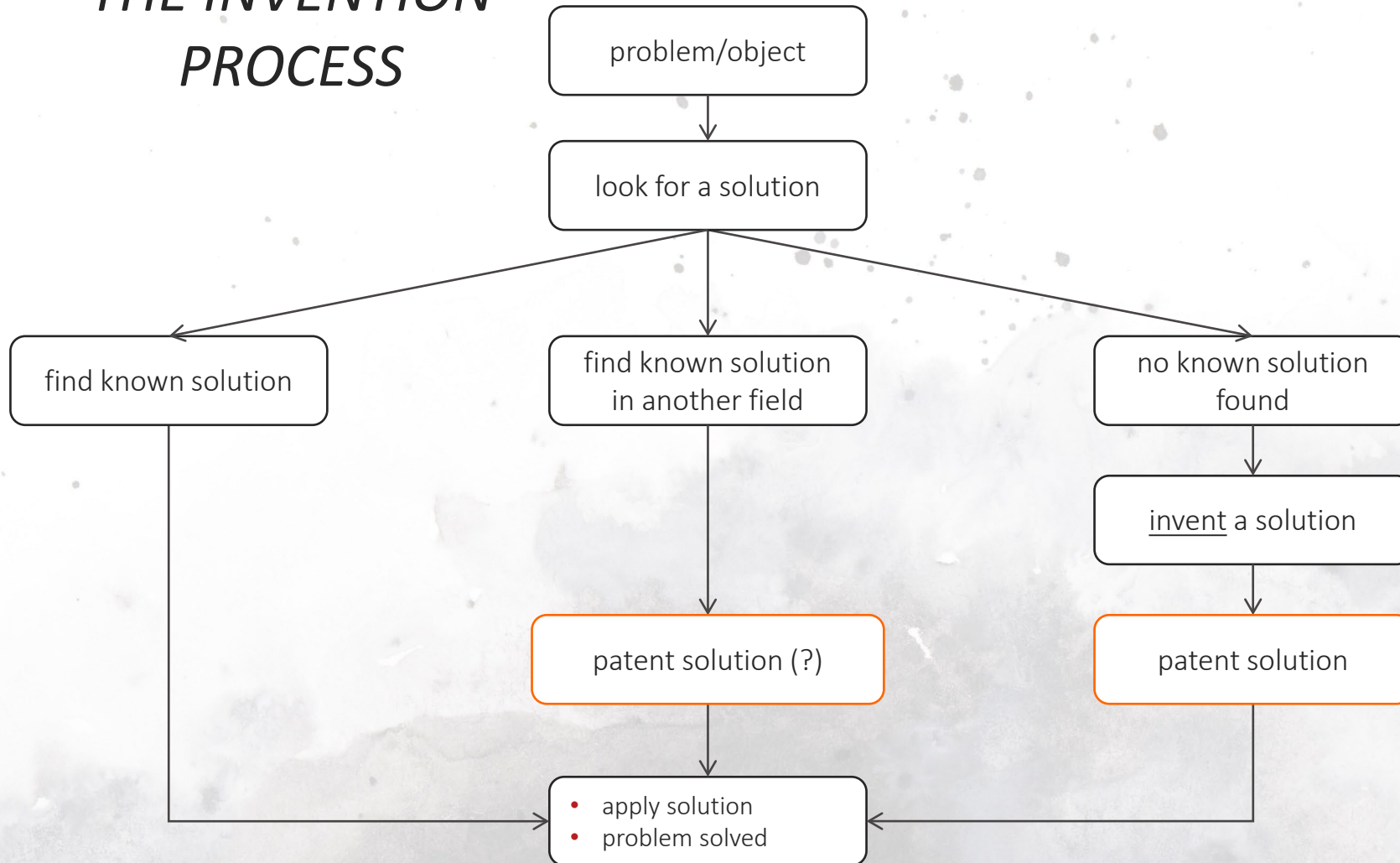
„Es ist nicht genug, dass man etwas erfindet, man muss auch merken, dass man etwas erfunden hat.“

Karl Steinbuch (1917 – 2005)

Cyberneticist, communications engineer, information theorist



THE INVENTION PROCESS



Caution:

- “no known solution found”: there may still be one.
- “patent solution” means “apply for a patent”: success not guaranteed
- The solution might infringe existing patents

“SOFTWARE PATENTS”

- ⌘ Term was introduced by opponents
- ⌘ “official” term: Computer Implemented Invention (CII)
- ⌘ Software patents do not exist in the law. European Patent Law (and German, too) states:
 - ⌘ *“The following in particular shall not be regarded as inventions [...]:*
 - ⌘ *discoveries, scientific theories and **mathematical methods**;*
 - ⌘ *aesthetic creations;*
 - ⌘ *schemes, rules and **methods for performing mental acts**, playing games or doing business, and **programs for computers**;*
 - ⌘ *presentations of information.”*
- ⌘ Later on there is a restriction to the excluded things *“as such”*
- ⌘ Software is already protected by copyright when it is written
 - ⌘ Redoing the programming (with reformulations) is allowed (under copyright) but can be protected with a patent
 - ⌘ A patent protects the inventive concept (=idea) behind the programming
- ⌘ There is no special patent right for CII. The same law applies also for hinges, car engines and broom bristles

“AI” APPLICATIONS – EPO EVENT, MAY 2018

Core “AI”	Training / machine learning	“AI” as a tool
<p>Algorithms “<i>as such</i>” are excluded from patenting</p>	<ul style="list-style-type: none"> • Training with specific data sets • “Use” of AI patentable analogously to the use of pharmaceutical products 	<ul style="list-style-type: none"> • Autonomous driving • Diagnostic tool • Production robot • Image recognition/sorting • Speech recognition • Speech generation • Measuring systems • etc...


EXAMPLES: “AI” PATENTS (CORE AI)

US 9,679,258: “METHODS AND APPARATUS FOR REINFORCEMENT LEARNING”

Application date: Dec. 05, 2013 – Applicant: Google Inc. – Granted: Jun. 17, 2017

1. A method of **reinforcement learning**, the method comprising:
 - obtaining training data relating to a subject system being interacted with by a reinforcement learning agent that performs actions from a set of actions to cause the subject system to move from one state to another state;
 - wherein the **training data comprises a plurality of transitions**, each transition comprising respective starting state data, action data and next state data defining, respectively, a starting state of the subject system, an action performed by the reinforcement learning agent when the subject system was in the starting state, and a next state of the subject system resulting from the action being performed by the reinforcement learning system; and
 - training a second neural network** used to select actions to be performed by the reinforcement learning agent on the transitions in the training data and, for each transition, a respective target output generated by a first neural network, wherein **the first neural network is another instance of the second neural network** but with **possibly different parameter values** than those of the first neural network; and
 - during the training, **periodically updating the parameter values of the first neural network from current parameter values of the second neural network**,
 - wherein the state data and the next state data in each transition are image data.

“AI” APPLICATIONS – EPO EVENT, MAY 2018

Core AI	Training / machine learning	AI as a tool
<p>Algorithmic “such” are excluded from patenting</p> 	<ul style="list-style-type: none"> • Training with specific data sets • “Use” of AI patentable analogously to the use of pharmaceutical products 	<ul style="list-style-type: none"> • Autonomous driving • Diagnostic tool • Production robot • Image recognition/sorting • Speech recognition • Speech generation • Measuring systems • etc...

PATENTING AI APPLICATIONS

- ⌘ CS/AI is a relatively young discipline. Patent Offices have problems with applying existing law.
- ⌘ Core questions for AI – same as for CIs in general (besides clarity, novelty, inventive step, etc.):
 - ⌘ Technicality (A52 EPC, Sec. 1 PatG)
 - ⌘ Technical contribution to inventive step (A56 EPC, Sec. 4 PatG)
 - ⌘ Sufficient disclosure (A83 EPC, Sec. 34(4) PatG)
- ⌘ Examination (before the EPO) has established two hurdles:
 - ⌘ “First technical hurdle” – “... patents shall be granted for any inventions, in all fields of technology..”
 - ⌘ Solutions:
 - ⌘ (... implemented by using a computer, computer network or other ...)
 - ⌘ “Computer implemented method ...” (reference to technical field might be sufficient)
 - ⌘ “Second technical hurdle” – merely technical features are taken into consideration for assessing the inventive step
 - ⌘ Ideally a technical effect is achieved, e.g. effect on car or cooling system effect

EXAMPLES: “AI” PATENTS (APPLICATIONS)

EP 3 704 573: “METHOD FOR PERFORMING A SOFTWARE UPDATE IN A CONTROL UNIT OF A MOTOR VEHICLE, AND MOTOR VEHICLE DESIGNED ACCORDINGLY”

Application date: Apr. 29, 2019 – Audi AG – Granted: Aug. 25, 2021

1. Method for performing a software update in a control device (11) of a motor vehicle (10), wherein during driving operation of the motor vehicle (10), while the motor vehicle is rolling and/or an engine of the motor vehicle is in operation, for a predetermined future time interval (22), in which the control device (11) is operated to generate control data (15, 16), a rest time interval (21), in which the generation of the control data (15, 16) of at least one software module (18) of the control device (11) is interrupted during the driving operation at least for a predetermined minimum time period (24) due to a then present vehicle condition, is predicated by a first analysis device (12) of the motor vehicle (10) and at the beginning of the rest time interval (21) the software update is started, wherein for identification of the rest time interval (21), it is determined with reference to the operating data which control tasks are conveyed to the control device (11) and/or which other vehicle components the at least one software module of the control device (11) requests, and the first analysis device (12) determines the rest period interval (21) on the basis of a machine learning method (23) and/or a predictive analytics method, in that at least one driving operation pattern of the motor vehicle (10) is determined with reference to historical operating data of the motor vehicle (10) and the at least one driving operation pattern is recognised in order to identify the rest time interval (21), and at a start (25) of the rest time interval (21), a software update of a new software module (18') is carried out in the control device (11), by which the software module (18) is replaced, and thereafter control data (16) are then generated again by the newly installed software module (18'), the driving operation of the motor vehicle (10) not being interrupted for the software update.

EXAMPLES: “AI” PATENTS (APPLICATIONS)

EP 3 208 681: „CONTROL METHOD FOR A COOLING SYSTEM WITH VARIABLE COOLING POWER AND COOLING SYSTEM”

Application date: Feb. 08, 2017 – Andras Lelkes – Granted: May 19, 2021

1. Method for **controlling a cooling system** (2) with variable cooling capacity which, in addition to the setpoint value determining the cooling capacity specified by the superimposed unit (1), receives information from the equipment to be cooled and/or from the environment, characterized in that the cooling system (2) uses this information to check the setpoint value supplied by the superimposed unit (1) for **plausibility** and, in the case that a potential malfunction of the superimposed unit (1) during the setpoint setting is detected, the cooling system (2) **autonomously increases its cooling capacity as a precaution in order to reduce the negative effects of a possibly incorrect setpoint setting by the superimposed unit** (1).
6. Method according to claim 1, characterized in that a unit (6) capable of learning learns to **predict the current value of the necessary cooling capacity ...**
8. Method according to claim 6, characterized in that the unit (6) capable of learning works with one, or with a combination of several known mathematical learning methods, such as Decision Tree Learning, k-Nearest Neighbor, Linear Regression, Logistic Regression, Winnow, LASSO, Ridge Regression, ARIMA, Perceptron, Artificial Neural Networks, Deep Learning, Naive Bayes, Bayesian Network, Support Vector Machine, Boosting, Reinforcement Learning, Markov Chain or Hidden Markov Model.
11. Cooling system (2) with variable cooling capacity, characterized in that the cooling system (2) comprises a **learning unit (6) which learns to forecast...**

EXAMPLES: “AI” PATENTS (APPLICATIONS)

EP 3 121 810: “APPARATUS AND METHOD OF ACOUSTIC SCORE CALCULATION AND SPEECH RECOGNITION”

Application date: Jul. 22, 2016 – Applicant: Samsung – Granted: May 09, 2018

1. A method of **calculating an acoustic score**, the method comprising:
 - sequentially extracting (310; 410) audio frames into windows;
 - calculating (320; 430) an acoustic score of a window by using a deep neural network, DNN,-based acoustic model;**
 - adding (420) padding frames to both sides of the window, wherein the padding frames added to the window overlap with one or more frames of a window adjacent to the window; and
 - re-calculating (450) an acoustic score** of the overlapping frames of the window based on a pre-calculated acoustic score of the padding frames of the adjacent window.

RECAP: EXAMPLES: “AI” PATENTS (CORE AI)

US 9,679,258: “METHODS AND APPARATUS FOR REINFORCEMENT LEARNING”

Application date: Dec. 05, 2013 – Applicant: Google Inc. – Granted: Jun. 17, 2017

1. A method of **reinforcement learning**, the method comprising:
 - obtaining training data relating to a subject system being interacted with by a reinforcement learning agent that performs actions from a set of actions to cause the subject system to move from one state to another state;
 - wherein the **training data comprises a plurality of transitions**, each transition comprising respective starting state data, action data and next state data defining, respectively, a starting state of the subject system, an action performed by the reinforcement learning agent when the subject system was in the starting state, and a next state of the subject system resulting from the action being performed by the reinforcement learning system; and
 - training a second neural network** used to select actions to be performed by the reinforcement learning agent on the transitions in the training data and, for each transition, a respective target output generated by a first neural network, wherein **the first neural network is another instance of the second neural network** but with possibly different parameter values than those of the first neural network; and
 - during the training, periodically **updating the parameter values of the first neural network from current parameter values of the second neural network**,
 - wherein the state data and the next state data in each transition are image data.

RECAP: EXAMPLES: “AI” PATENTS (CORE AI)

EP 3 055 813: “METHODS AND APPARATUS FOR REINFORCEMENT LEARNING”

Application date: Oct. 07, 2014 – Applicant: Google Inc. – Granted: May 06, 2020

1. A computer-implemented method of reinforcement learning for controlling steering of a vehicle, the method comprising:
 - inputting training data relating to a subject system comprising the vehicle, the subject system having a plurality of states and, for each state, a set of actions to move from one of said states to a next said state;
 - wherein said training data is generated by operating on said subject system with a succession of said actions and comprises experience data comprising a plurality of transitions, each transition comprising respective starting state data, action data and next state data defining, respectively for a plurality of said actions, a starting state, an action, and a next said state resulting from the action, wherein a state is defined by image data, sound data or sensory information from one or more sensors; and
 - training a second neural network, the second neural network being an instance of the same neural network as a first neural network, wherein training the second neural network comprises:
 - selecting a transition from the experience data;
 - generating, with the first neural network, a target action-value parameter for the selected transition;
 - updating weights of the second neural network based on the difference between the target generated by the first neural network and an action-value parameter generated by the second neural network;
- the method further comprising:
- during the training, updating weights of said first neural network based on the updated weights of said second neural network, wherein updating of said first neural network from said second neural network is performed at intervals; and
- wherein the second neural network is configured to provide an output to an action selector for use in selecting output data defining a selected action for controlling steering of the vehicle.

EXAMPLES: “AI” PATENTS (APPLICATIONS)

EP 3 471 005: “ARTIFICIAL NEURAL NETWORK”

Application date: Oct. 13, 2017 – Applicant: Nokia – Granted: Oct. 07, 2021

11. An apparatus (110, 300) comprising:

- means (320) for storing training data in a memory;
- means (310) for providing a trusted execution environment,
- means (310) for running, in the trusted execution environment, a training process configured to obtain parameters of a neural network, using the training data, characterized by , wherein

the apparatus is configured to add, in the trusted execution environment, after the parameters of the neural network have been optimized, random noise to the parameters of the neural network, and to provide the parameters to a computer (130) distinct from the apparatus (110, 300) after the adding of the random noise.

CLOSING NOTES

- ⌚ Maintain an **inventor's log!**
- ⌚ Review your log and ask yourself:
 - ⌚ Did I **invent something** today?
 - ⌚ Am I using a **technical feature** in my invention?
 - ⌚ Am I solving a **technical problem** with my invention?
 - ⌚ Does my invention have a **technical effect**?
 - ⌚ Is my solution obvious in the light of the prior art?
- ⌚ Reminder: technical character is not defined positively. Law and case law only specify what is not deemed to be an invention.



Burger Rechtsanwaltsgesellschaft

Wir schützen Erfolg!

THANK YOU FOR YOUR ATTENTION.

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