



How to protect research results with Intellectual Property

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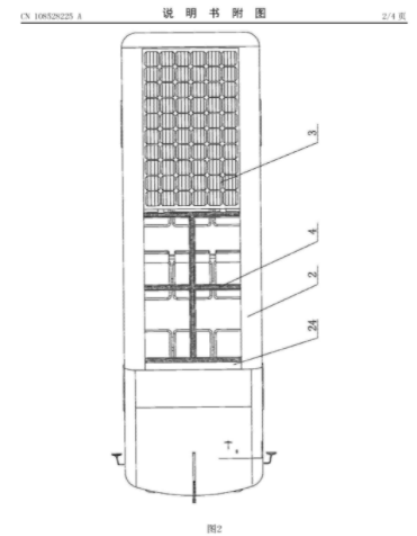
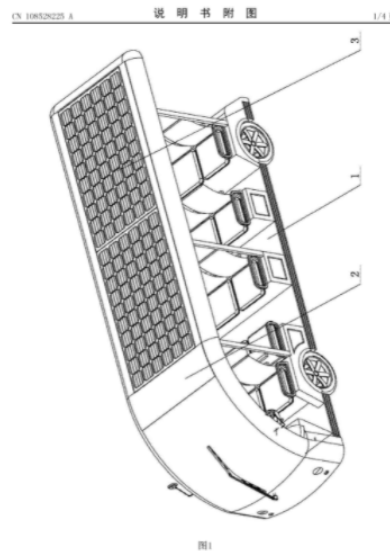
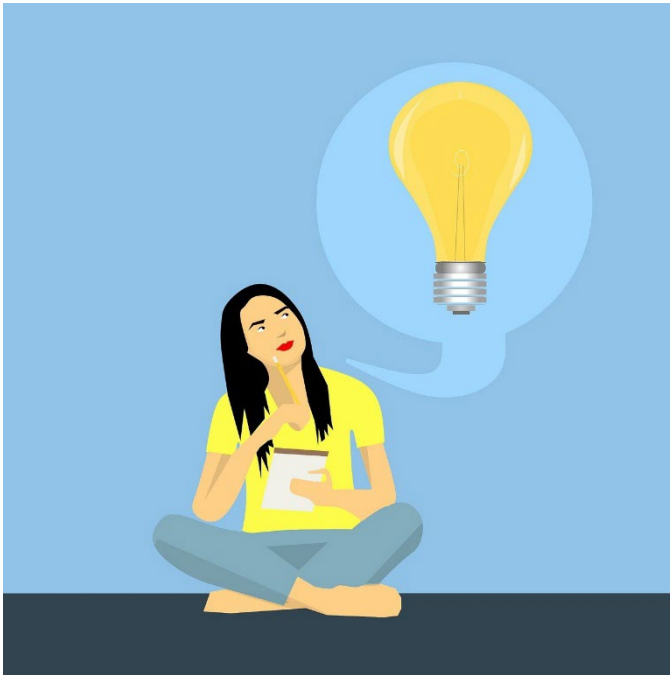
Why should a researcher care about IPRs?

because....

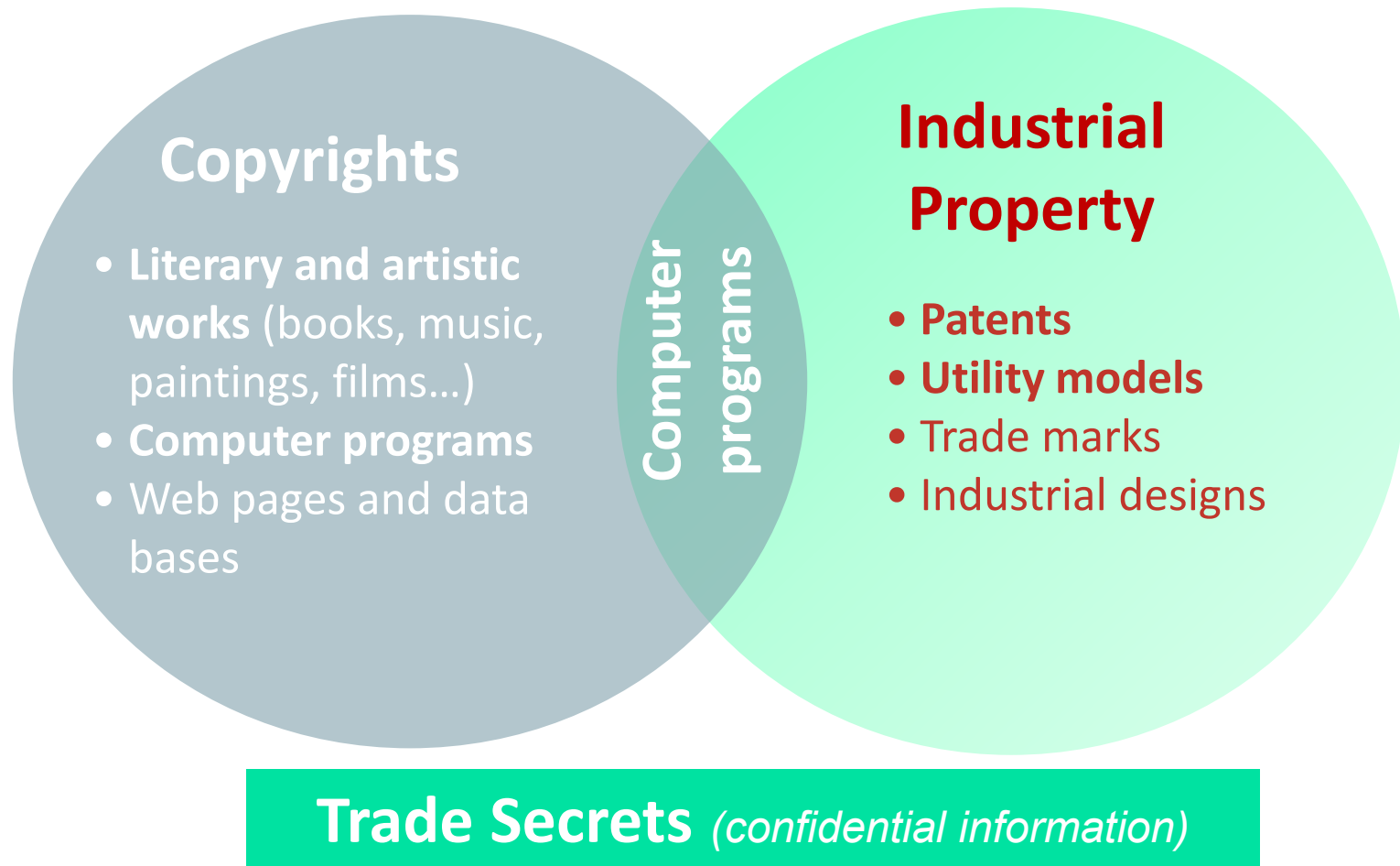
- IP is everywhere around
- IPR is an essential asset in the knowledge-intensive economy (protects small and innovative intensive companies)
- You may generate valuable IP that enable you:
 - To avoid others from using your work without your consent
 - To obtain benefits through licensing it to third parties or by own exploitation
 - To obtain academic recognition and get financial backing
- You must be aware of others' IPRs in order not to infringe them and to build up from it

Can ideas be protected?

Ideas are an essential first step toward any invention but without some identifiable manifestation there can be no IP.



What are Intellectual Property Rights (IPRs)?



Copyright vs. Industrial Property

Similarities	Differences
Economic relevance	Object of protection (cultural vs industrial)
Human creation	Legal base
Exclusive rights	Ways rights are born
Intangible assets	Content, geographical and time limits

One product = multiple IPRs



1.500 to 2.000 patents

Data-processing methods, semiconductor circuits, chemical compounds, etc.

+

Registered design

Shape of phone

Registered trade marks

Brand name, start-up and ring tone (i.e. Nokia Tune)

Copyright

Software, ringtones and images

Trade secret

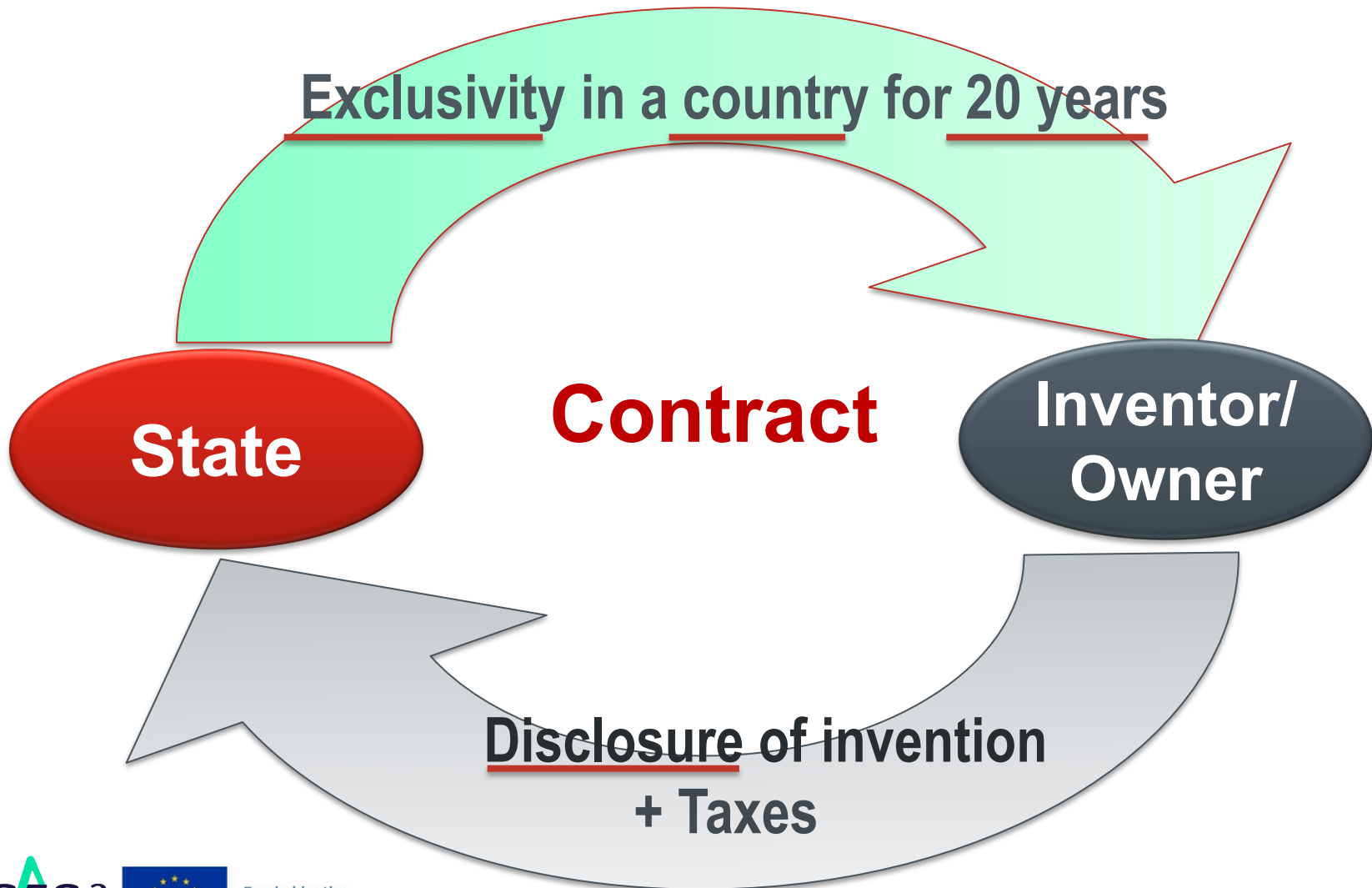
market research and strategies

Patents



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What is a patent?



What can be patented?

The following are not patentable inventions:

- discoveries, scientific theories, mathematical methods
- aesthetic creations
- schemes, rules and methods for performing intellectual or economic activities or games
- **computer programs.**
- presentations of information
- medical or diagnostic treatment
- inventions whose commercial exploitation would be contrary to morality (e.g. cloning of human life, genetic modification of humans)
- plants or animal varieties

Article 52-53 European Patent Convention (EPC)

What requirements must an invention meet in order to be patentable?

Inventions that solve a technical problem only if they are:

- **New** (does not form part of the state of the art)
- Involve **Inventive step** (not obvious to a person skilled in the art)
- Susceptible of **Industrial application** (solve a technical problem, not necessarily in a profitable way)

The invention might be a product, a process/method, or a chemical compound.

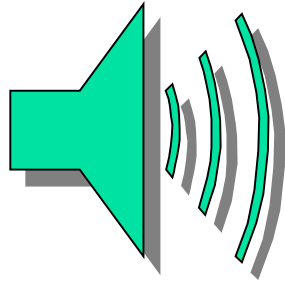
Article 52(1) EPC

What is the “state of the art”?

Everything (in the world) made available to the public by means of ...





... before the filing date of the application



**Keep inventions
confidential ...until filing
a patent application!**

First patent, then publish

What information do patents contain?

(19)  (11)  EP 3 573 229 A1

(12) **EUROPEAN PATENT APPLICATION**
published in accordance with Art. 153(4) EPC

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(54) **CONTROL DEVICE AND METHOD FOR PHOTOVOLTAIC PUMP SYSTEMS**

(57) The invention relates to a method and a control device (4) for pumping systems, which, by means of a PID algorithm, regulates the operating frequency of variable-frequency drives (2) connected between a photovoltaic generator (1) and a pumping unit (3), to keep the voltage of the generator (1) within a reference voltage and above the minimum power voltage of the variable-frequency drives (2). When the control device (4) detects a sharp fall in the DC voltage of the generator (1) below a first threshold value, it deactivates the PID algorithm to establish a frequency lower than the operating frequency of the variable-frequency drives (2) and a minimum gradient of sudden deceleration for an increase in the voltage of the variable-frequency drives (2). When the control device detects that the DC voltage has returned above a second threshold value, the PID controller of the control device (4) is reactivated.

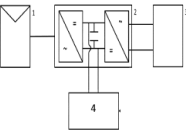


FIG.1

1 EP 3 573 229 A1 2

Description

OBJECT OF THE INVENTION

[0001] The present invention lies within the technical field of photovoltaic technologies and, more specifically, is related to control methods and systems for operating with solar photovoltaic pumping systems, applicable to the agricultural and renewable energies sector.

[0002] More specifically, the present invention relates to a control device and method able to be incorporated in any photovoltaic (PV) pumping system for stabilising the operation thereof with regard to fluctuations in the photovoltaic power produced by the sharp variation of solar radiation.

BACKGROUND OF THE INVENTION

[0003] Photovoltaic (PV) pumping systems comprise multiple photovoltaic modules for capturing solar radiation, connected to the extraction pump by one or several variable-frequency drives which pumps the water during the hours of sunlight. The flow of direct solar pumping is not constant, since the irradiation is variable, based on the hours of the day or meteorological phenomena.

[0004] In current PV pumping systems, an intermittence of photovoltaic power, for example due to the passing of a cloud, produces a destabilisation of the variable-frequency drive of the pumping system, causing an abrupt stoppage. This stoppage is not merely an aesthetic issue, but rather causes two problems that affect the reliability and lifespan of the PV pumping system. The first is a water hammer, which reduces the lifespan of the hydraulic system. The second is the wave reflection of the electrical voltage between the output stage of the variable-frequency drive and the pump motor, which produces surges that can damage both components.

[0005] One example of a PV pumping system which aims at stabilising the pumping of a water extraction pump for achieving an irrigation with constant pressure and flow is described in ES 1074806 U. This system has one or more booster pumps that have a greater flow than

DESCRIPTION OF THE INVENTION

[0007] The present invention is aimed at solving the aforementioned problem, resolving the drawbacks of the mentioned solutions of the state of the art, by means of a device with a control method that prevents the destabilisation of variable-frequency drives in photovoltaic (PV) pumping systems when there are PV power fluctuations. The control device and method proposed allow the standard control system of PV pumping systems to be used, eliminating the problems that occur when there are sharp drops in available PV power, due to the passing of a cloud, for example.

[0008] A first aspect of the invention relates to a control method for PV pumping systems, comprising:

- a proportional-integral-derivative (PID) algorithm, which acts on at least one variable-frequency drive connected to the output of the photovoltaic generator and which establishes an operating frequency, the PID control algorithm being configured for:
- reducing the operating frequency of the variable-frequency drive when the measured output voltage of the photovoltaic generator is less than an established reference voltage,
- increasing the operating frequency of the variable-frequency drive when the measured output voltage of the photovoltaic generator is greater than the established reference voltage;

wherein the reference voltage is established as:

- a voltage corresponding to a maximum power point of the photovoltaic generator for pumping systems with variable flow and pressure; or
- a voltage corresponding to a power point demanded from the photovoltaic generator by the pumping system for pumping systems with constant flow and pressure.

[0009] The control method further comprises the fol-

Claims

30 1. A control method for photovoltaic pumping systems comprising:

35 - measuring an output voltage of a photovoltaic generator (1),

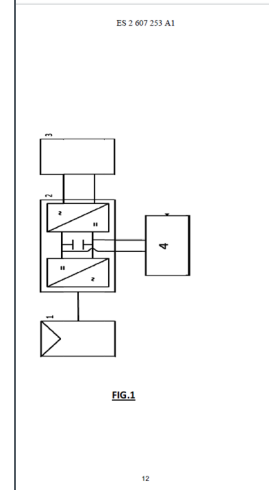
- establishing a reference voltage corresponding to a maximum power point of the photovoltaic generator (1) for pumping systems with variable flow and pressure and corresponding to a power point demanded from the photovoltaic generator (1) by the pumping system for pumping systems with constant flow and pressure,

40 - a proportional-integral-derivative (PID) algorithm, which acts on at least one variable-frequency drive (2) connected to the output of the photovoltaic generator (1) and which establishes an operating frequency, the PID control algorithm being configured for:

45 - reducing the operating frequency of at least one variable-frequency drive (2) when the measured output voltage of the photovoltaic generator (1) is lower than the established reference voltage,

50 - increasing the operating frequency of the at least one variable-frequency drive (2) when the measured output voltage of the photovoltaic generator (1) is greater than the established reference voltage;

55



1st Page:
Identification data,
title, abstract,
Classification (CIP)

Background, technical
description (problem
and technical solution)

Claims
(scope of
protection)

Figures
(only if
needed)

Patent documents are accessible free of charge and may be used to:

- **Find out** what exists and build on it (avoid duplicating)
- **Check out** if my invention is new.
- **Avoid** infringing other people's rights “Freedom to Operate”
- **Keep track** of what others are doing.

Espacenet (FREE)

access to over
130 million
patent documents
easily searchable

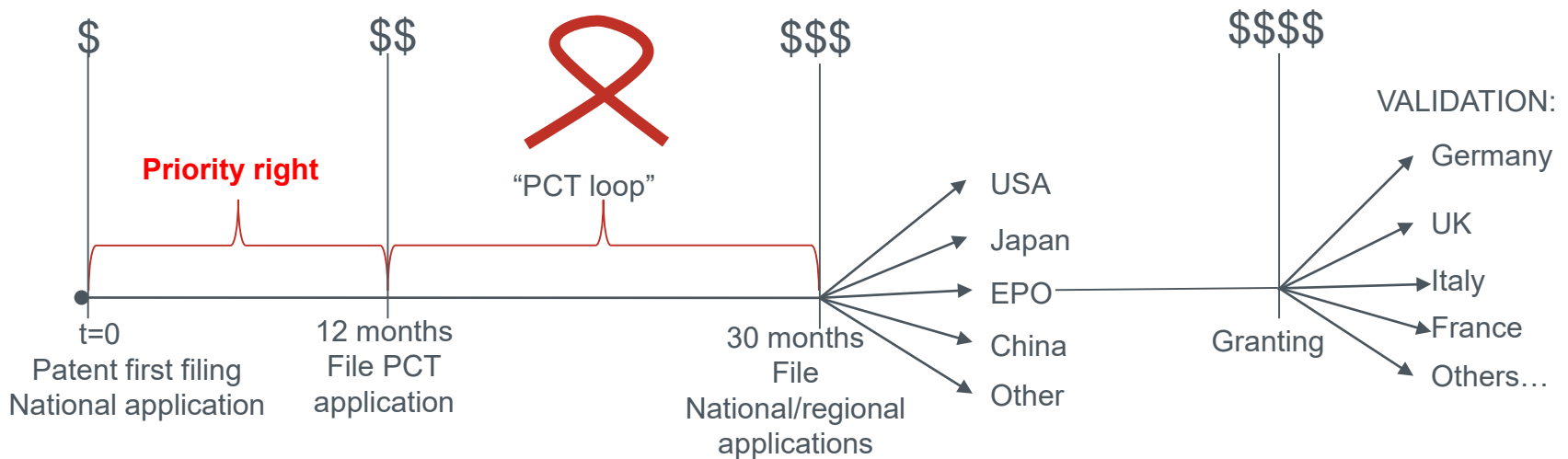
Patent Translate

Automatic translation
to and from English
and over 30
languages

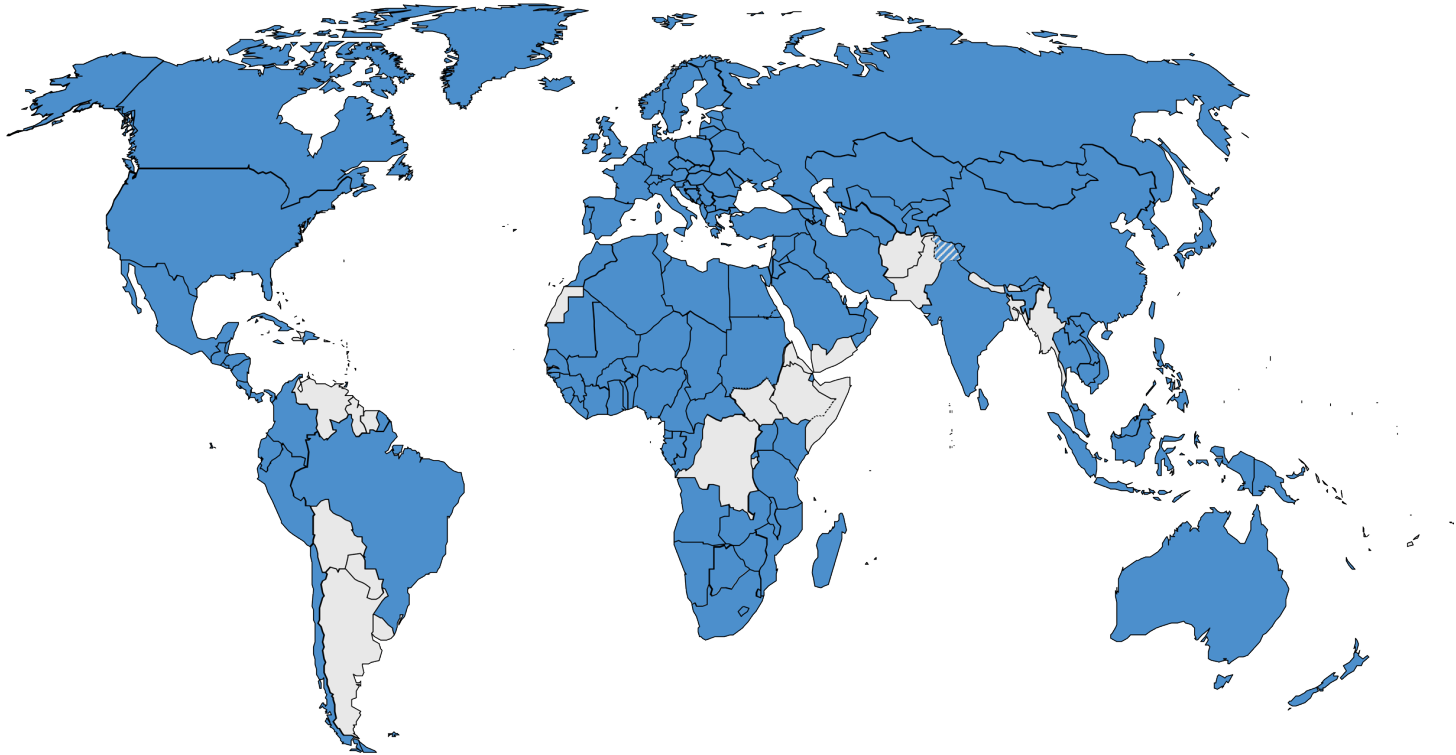
Can I extend my patent to other countries?

There is not such thing as an international patent

Patents must be filed in the country where protection is sought
There are international agreements that facilitate the process



PCT Countries (157)



Map showing the geographic coverage of European patents as of 15 January 2024

■ Member states (39)

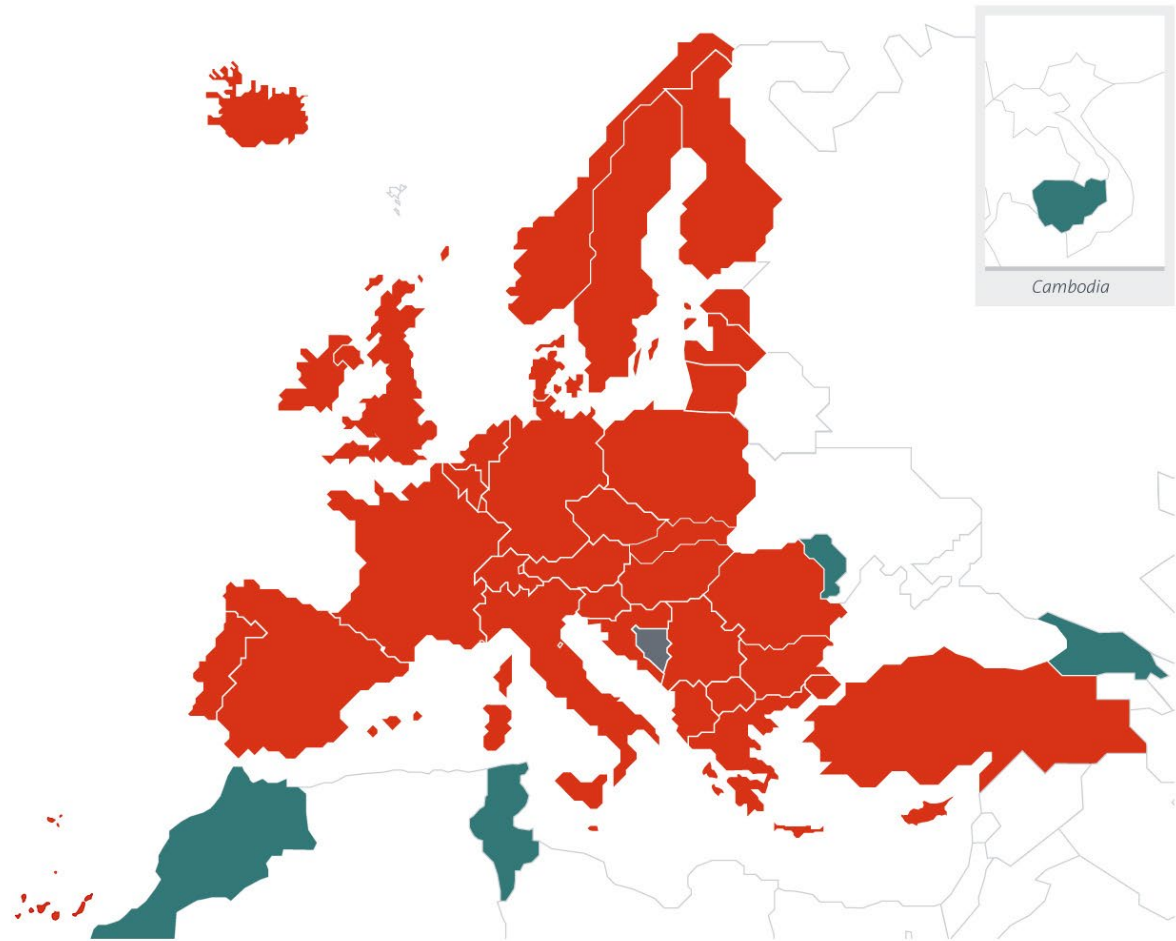
- Albania
- Austria
- Belgium
- Bulgaria
- Croatia
- Cyprus
- Czech Republic
- Denmark
- Estonia
- Finland
- France
- Germany
- Greece
- Hungary
- Iceland
- Ireland
- Italy
- Latvia
- Liechtenstein
- Lithuania
- Luxembourg
- Malta
- Monaco
- Montenegro
- Netherlands
- North Macedonia
- Norway
- Poland
- Portugal
- Romania
- San Marino
- Serbia
- Slovakia
- Slovenia
- Spain
- Sweden
- Switzerland
- Türkiye
- United Kingdom

■ Extension states (1)

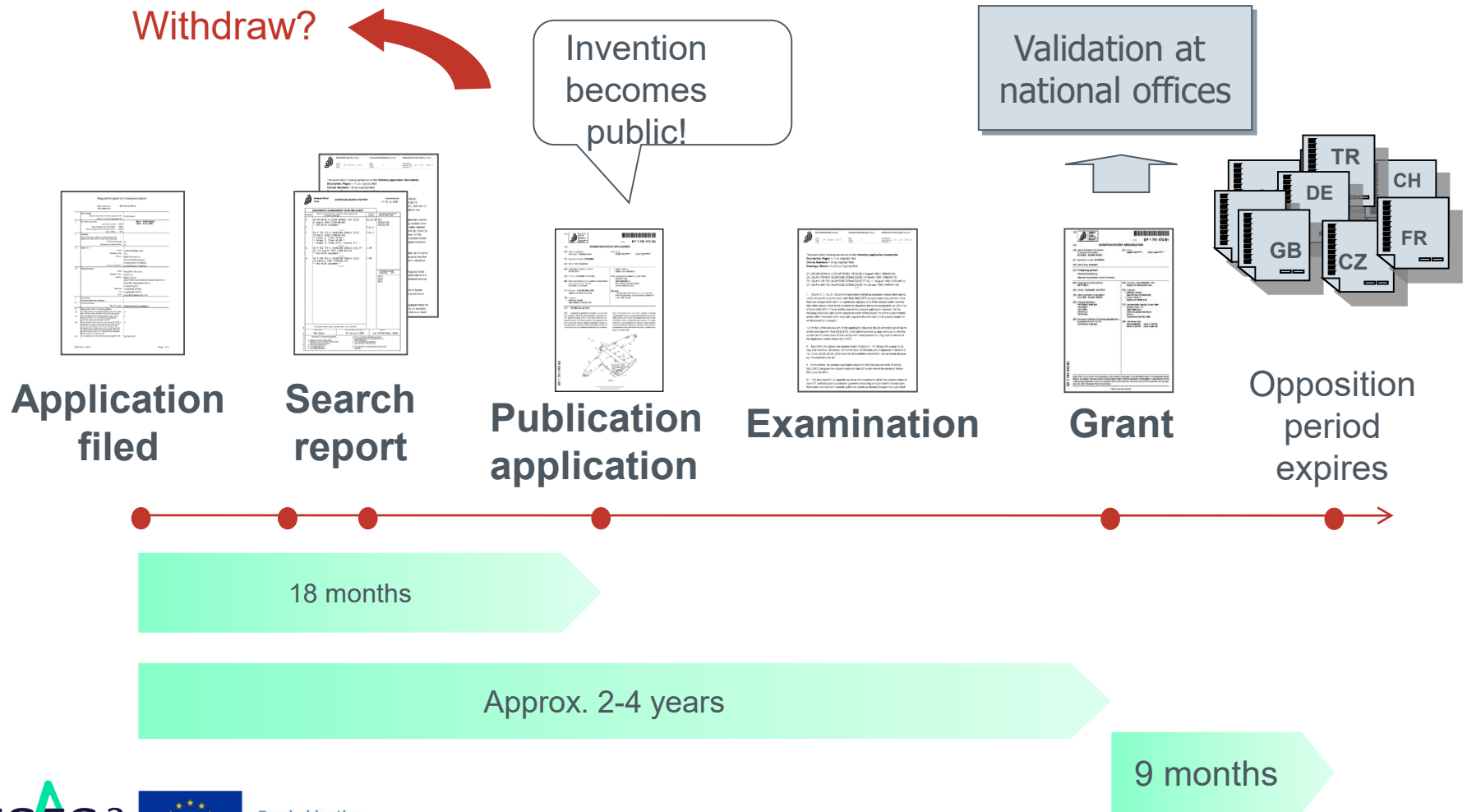
- Bosnia and Herzegovina

■ Validation states (5) *Agreement in force*

- Cambodia
- Georgia
- Republic of Moldova
- Morocco
- Tunisia



How are patents obtained at the EPO?



How much does a patent cost?

The price has two components:

- **Official fees** depend on the national/regional patent offices (Filing, granting, renewal)
- **Patent attorney's fees** depend on the complexity of the invention, the objections raised during the examination by the patent office,...

Patenting costs are eligible costs in many projects (i..e. Horizon Europe) and they might be included in the Budget.

¿Who owns inventions developed jointly by researchers from different institutions?

Results of European projects, by default, belong to the institution that has generated them.

When results from different institutions cannot be separated there will be joint ownership. A co-ownership agreement must be signed to regulate:

- ✓ Share of ownership (%)
- ✓ Authorship
- ✓ Institution in charge of patent management and cost sharing
- ✓ Conditions for abandonment, internationalization, commercialization....

Alternatives to patenting

Disclose (publish) the information

- No cost
- Prevents others from patenting the same invention

- Does not offer exclusivity
- Reveals the invention to competitors

Keep it a secret

- No cost
- Does not reveal the invention

- No protection against reverse-engineering
- Secrets leak quite fast

What should you do if you have an invention worth patenting?

- Find out if the technology already exists
- Avoid disclosing information before patent application
- Seek for advice to a patent expert (Patent attorney or Technology Transfer Office in case of university research)



"After fire and the wheel, it was only logical to invent the patent attorney."

A success story: Agricultural irrigation based on high-power photovoltaic pump systems

- UPM researchers developed an irrigation technology based on renewable energies
- Advantages: Reduce water consumption 30% and energy costs 60%-80%
- Potential consumers: farmers, cooperatives, irrigation communities
- Priority patent in Spain and extended to Argentina, Peru, and European Patent Office (EPO).
- Business model: sign numerous non-exclusive license agreements with the local installation SMEs



Control procedure and device for photovoltaic pump systems

[ES2607253B2](#) (Priority patent), [WO2018134453A1](#),
[AR110711A1](#); [EP3573229A1](#), [PE20191293A1](#)

Copyright



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What is copyright?

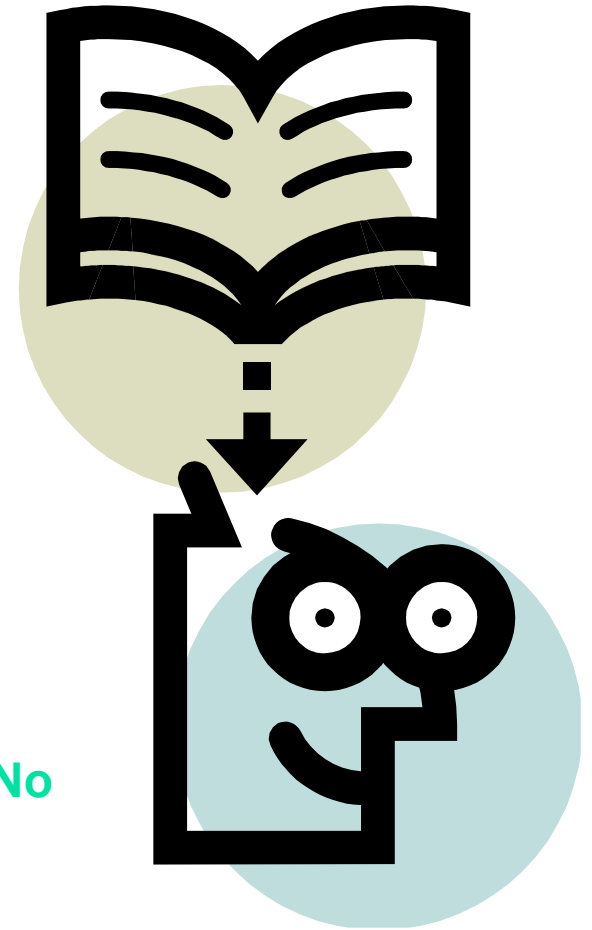
Copyright is a form of protection for **original** works of authorship **fixed** in a tangible medium of expression

It requires:

- Human creation
- Originality
- To be fixed in a tangible format. (Ideas are not protected but the way they are expressed are)

THE RIGHT IS BORN WITH CREATION OF THE WORK

Copyright exists from the moment the work is created. **No registration is required.**

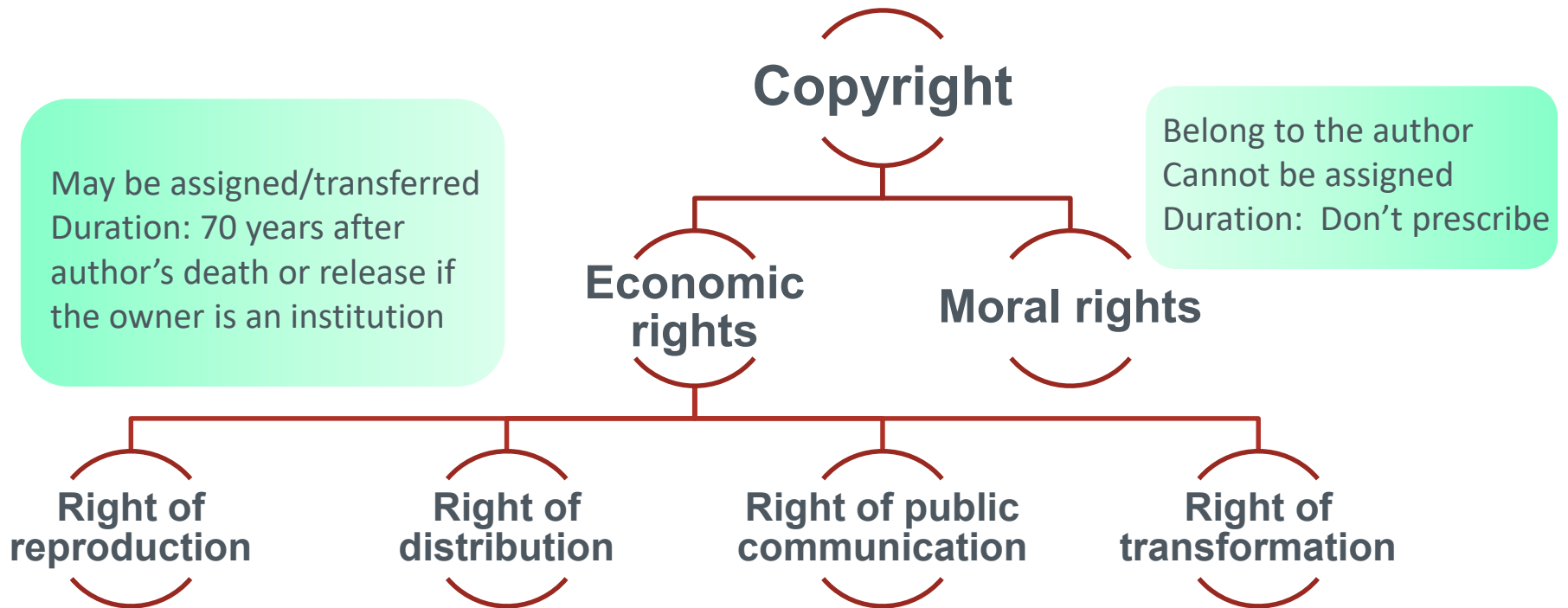


The case of the monkey selfies



- Selfies taken by macaques using equipment belonging to the British photographer D.Slater.
- Slater claimed copyright on the images
- The US Copyright Office stated that works created by a non-human are not subject to US copyright.

What rights does copyright confer?



Protection in a country is extensible to other countries according to international treaties.

What does copyright protect?

- Literary, dramatic, musical, and artistic works, such as poetry, novels, movies, songs, photography architecture, scientific works.....
- Computer programs
- Data bases
- Web pages and multimedia

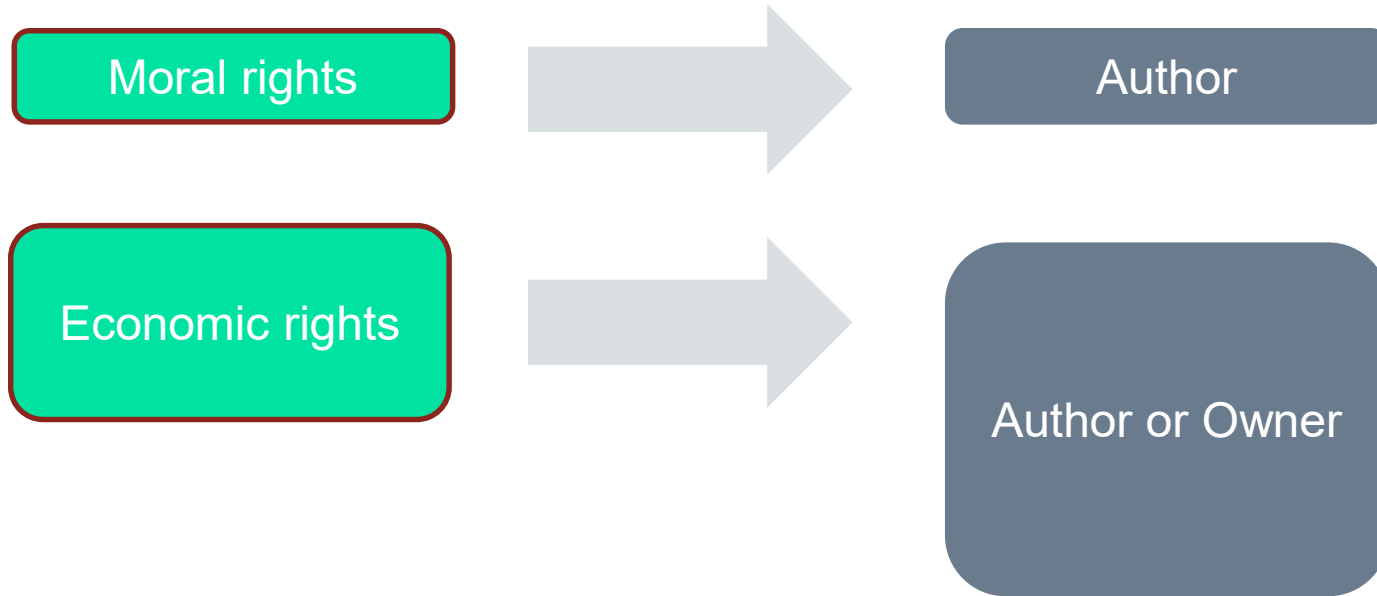
Copyright for computer programs

A computer program is a sequence of instructions for performing a specified task with a computer

.....it also includes the preparatory documentation, technical documentation and manuals for use of the program.

Computer programs → Their expression is protected but not the underlying ideas and principles

Who owns copyrights?



How can we protect copyright ?

- **Registry is not a requirement**

... **but provides legal advantage** in the event of an infringement suit because:

- It assumes the existence and ownership of IP rights
- It represents evidence before third parties (*Art. 319 Spanish Civil Prosecution Law*)

- In any case (registered or not) it is always recommended to use the © symbol:



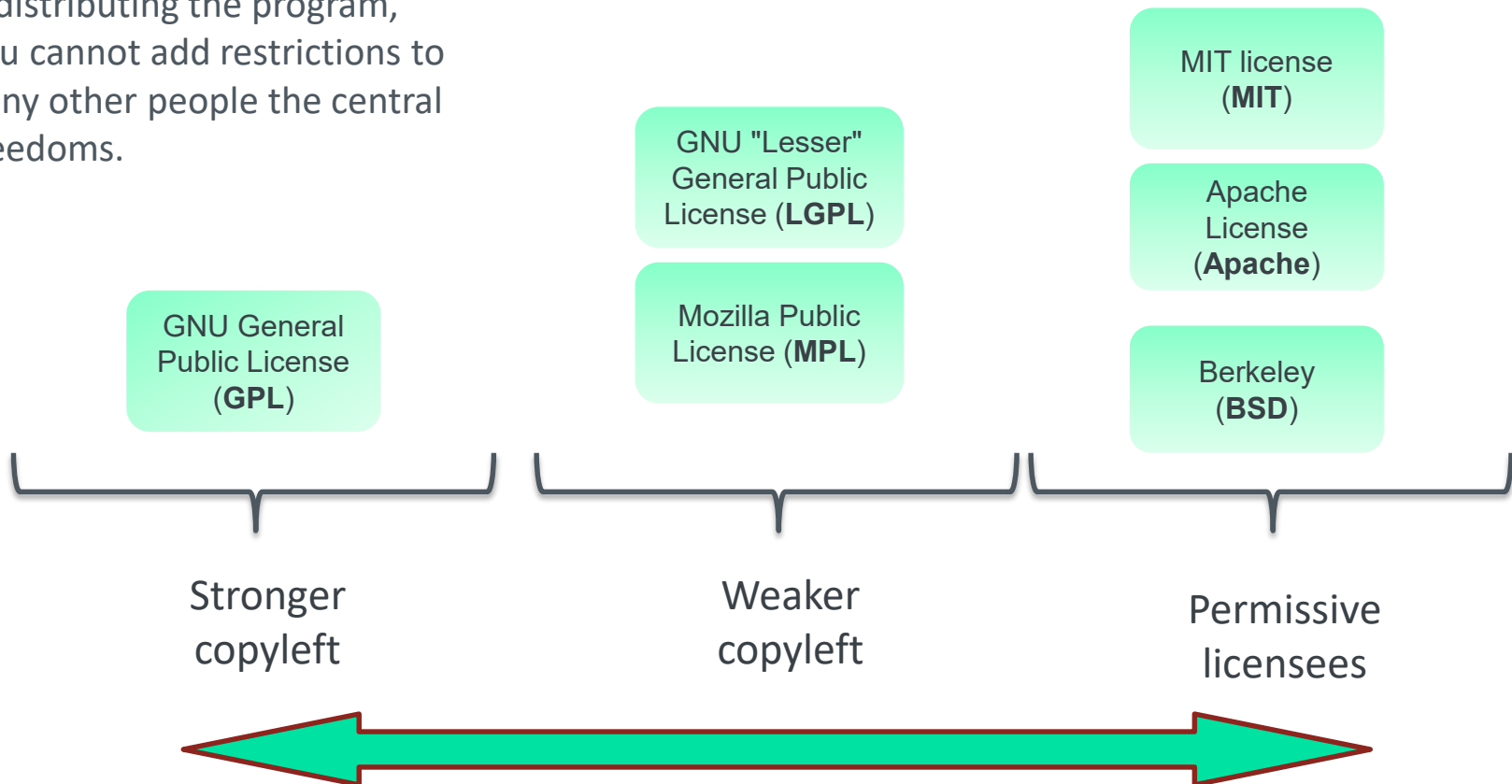
Categories of software licenses

- Proprietary licenses (close source)
- Free and open source licenses (grants access to the source code):
 - With weak restrictions
 - With strong restrictions

License: *Authorization or permission to do something on, or with, somebody else's property which, were it not for the license, could be legally prevented or give rise to legal action in tort or trespass.*

Types of open source licenses

Copyleft is the rule that when redistributing the program, you cannot add restrictions to deny other people the central freedoms.



Cost for copyrights

- Copyrights born with the creation of the work. No registration is required, so there's no cost associated.
- In case you decide to register copyrights, the cost in Spain is under 50€

Thank you for your attention!



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