

Expert Systems

Expert System

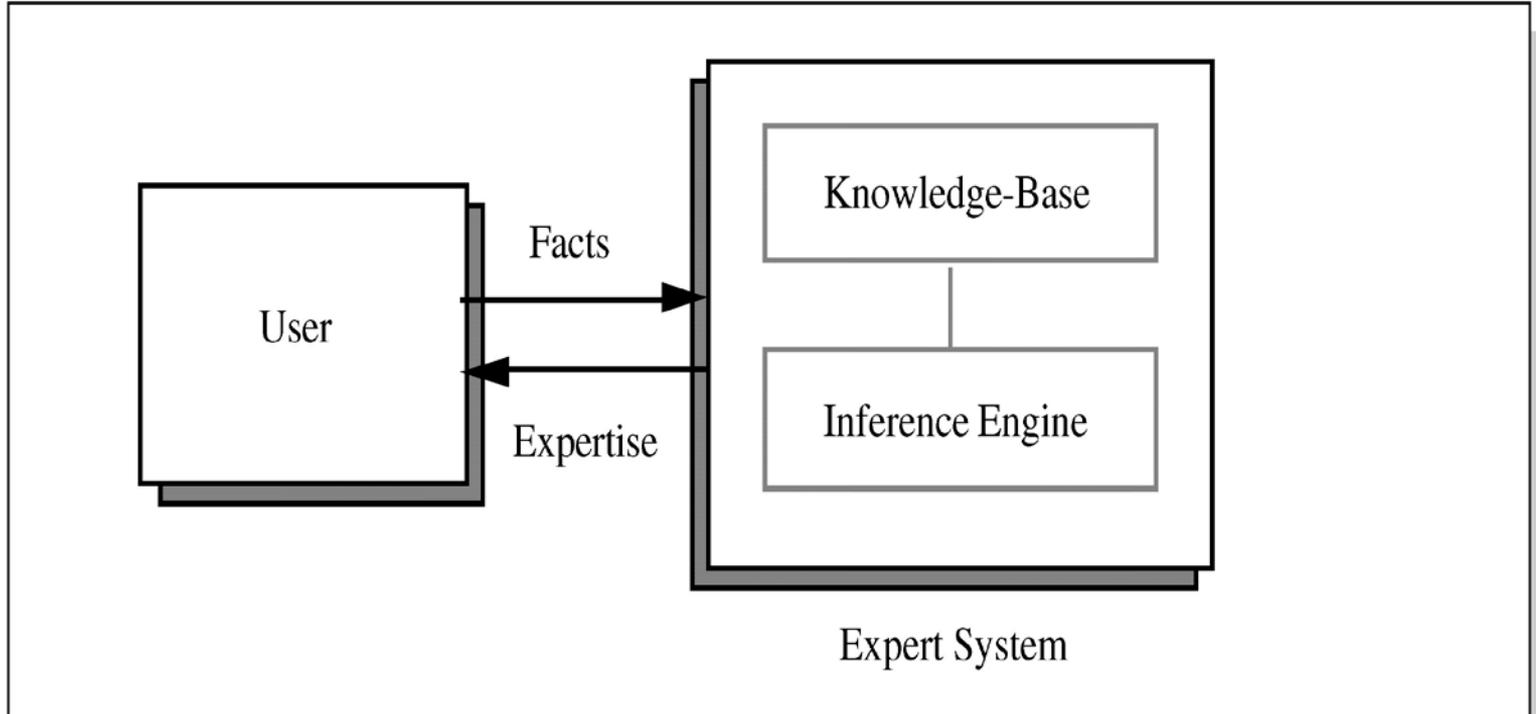
Computer software that:

- Emulates human expert
- Deals with small, well defined domains of expertise
- Is able to solve real-world problems
- Is able to act as a cost-effective consultant
- Can explain reasoning behind any solutions it finds
- Should be able to learn from experience.

What is an Expert?

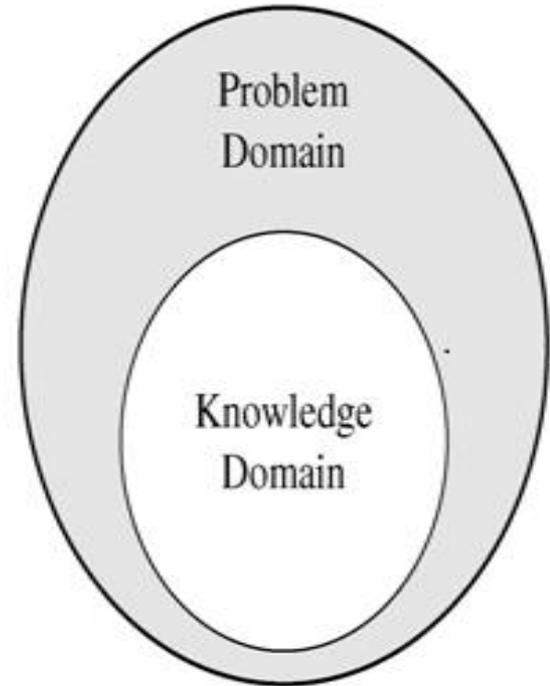
- Solve simple problems easily.
- Ask appropriate questions.
- Reformulate questions to obtain answers.
- Explain why they asked the question.
- Explain why conclusion reached.
- Judge the reliability of their conclusions
- Talk easily with other experts in their field.
- Learn from experience.
- Use tools such as heuristics, mathematical models and detailed simulations
- Transfer knowledge from one domain to another
- Use their knowledge efficiently

Basic Functions of Expert Systems



Problem Domain vs. Knowledge Domain

- An expert's knowledge is specific to one problem domain – medicine, agriculture, finance, science, engineering, etc.
- The expert's knowledge about solving specific problems is called the knowledge domain.
- The problem domain is always a superset of the knowledge domain.



Creating an Expert System

Two steps involved

- Extracting knowledge and methods from the expert (knowledge acquisition)
- Reforming knowledge/methods into an organised form (knowledge representation)

Paradigm of Rules

- Rules

If

Leaves are _____ and roots are _____

Then _____

- Rules

If

your soil colour is _____, texture is _____, WHC is _____

Then suitable crops are _____

Desirable Features of an Expert System

- Dealing with Uncertainty
 - certainty factors
- Explanation
- Ease of Modification
- Transportability
- Adaptive learning

Google Play Store interface showing the 'Rice Doctor' app page. The app is by LucidMobile, categorized under Education, and has a 4.5-star rating from 145 reviews. It is compatible with the user's device. The app icon features a green rice plant with a yellow ear of rice. Below the app name, there are three preview images: the app's main interface, a list of diseases (Anis, Bacterial blight, Bacterial leaf streak), and a close-up of a rice leaf with a calcium deficiency (rare) symptom.

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Website interface for 'Rice Knowledge Manager' (www.rkmp.co.in). The page features a user login section, a table of mobile apps, and various statistics. The table lists five apps: 'Rice Vocs App', 'Rice Crop FAQs', 'RKMP E-Learning App', 'Rice Innovations App', and 'RKMP Extension Tools App'. The page also includes a 'User login' section, a 'Total Number of Pages' section (15138), a 'Visitors Profile' section (4624 registered users), and a 'Site Traffic' section (1949969 reads).

www.rkmp.co.in

Follow this page for better sharing of views on rice crop.

RKMP Mobile Apps

RKMP in collaboration with C-DAC Hyderabad is developing a series of mobile apps for the benefit of Indian Extension Professionals and Farmers. While the efforts are going on for developing mobile apps in local languages (like diagnostics, crop manager, fertimeter and ricecheck app), here are some of the ready to use apps.

S.No	Name	Description	Download Link
1	Rice Vocs App	A ready reckoner for extension professional	Get it on Google Play
2	Rice Crop FAQs	Compendium of Kisan Call Centre Questions on Rice	Get it on Google Play
3	RKMP E-Learning App	With 20 e-courses for the benefit of Extension Professionals.	Get it on Google Play
4	Rice Innovations App	Farmers Rice Innovations 2011 & 2015	Get it on Google Play
5	RKMP Extension Tools App	More than 60 ready to use extension methods tool suit	Get it on Google Play

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Botany and Climate

Crop Protection

Season and Varieties

Farm Implements

Rice is one of the three most important food crops in the world and it is the staple food for over 2.7 billion people. In India, area under rice is 44.6 m ha with total output of 80 million tonnes (paddy) with an average productivity of 1855 kg/ha. It is grown in almost all the states. West Bengal, Uttar Pradesh, Madhya Pradesh, Bihar, Orissa, Andhra Pradesh, Assam, Tamil Nadu, Kerala, Punjab, Maharashtra and Karnataka are major rice growing states and contribute to total 92% of area and production.

[Paddy Sourced Web Links](#)

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Crop Protection

Experts assessment reveal that around 22 per cent of yield losses in Rice can be attributed to insect pests. Hence, it is necessary to reduce if not eliminate these losses by protecting the crops from different pests through appropriate techniques. At present day, the role of crop protection in agriculture is of great importance and a challenging process that involves, as the so called resistant species should be brought under check. All other management practices of crop husbandry will be futile if the crop is not protected against the ravages of pests to ensure of crop protection from the pests may be drastically destroyed. The entire effort of growing a crop will be defeated in absence of crop protection resulting in financial loss to the grower. So the crop protection against various pests is a must in agriculture.

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Crop Protection

Pests

- Leaf Folder
- Stem Borer
- Green Leafhopper
- Brown Plant Leafhopper
- White Backed Paddy Hopper
- Thrips
- Ear Head Bug
- Scavenging Caterpillar
- Gal Midge
- Cole Crows
- Rice Stopper

PESTS

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Stem borer

Classification of pest

- Egg**
Eggs are creamy white, flattened, oval and laid in a mass which is covered with buff coloured hairs. They are laid mostly near the tip of the leaves. Egg period is 5-8 days.
- Larva**
Pale yellow with dark brown head having prothoracic shield. Larval period is 28 to 30 days.
- Pupa**
White silken cocoon. Pupation takes place inside the rice stem, stalk or stubble. Pupal period is 8 to 10 days.
- Adult**
Female moth: has long yellowish brown with a black spot at the centre of the fore wings and a tuft of yellow hairs at the anal region.
Male moth: Smaller with pale yellow forewings without black spot.

Signs and Symptoms of Damage

- Presence of brown coloured egg mass near the leaf tip.
- In vegetative stage larva enters the stem and feeds on the growing shoot and causes drying of the central shoot known as **dead heart**.
- In grown up plant whole ear heads become dried and yield chiefly grains called as **white ear**.

Nature of Damage

In vegetative stages, the central shoot dies off leaving the leaf in colour (dead heart), in the ear bearing stage, the

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Cultural Methods

- Field should be necessarily be sown during the vulnerable crop growth stages for early detection of dead hearts and white ear.
- Remove and proper disposal of stubbles and keep the lower production low to feed crop.
- Site resistant varieties like Felma, Tigris, IR 22, IR 66, IR 64, AET 47, AET 48, AET 52, IR 60, AET 44, P 4, AET 46, Indira, Sankranti, Sankranti, Sankranti, Sankranti, Sankranti and Tolerantia.
- Cip the tip of the seedlings before transplanting to minimize egg masses.
- Cultivate and destroy the egg masses.
- Avoid close planting and continuous water stagnation at early stages.
- Pull out and destroy the affected plants.
- Harrow the crop up to the ground well and disturb the stubbles with plough immediately after the harvest to keep the lower production low in next crop.

Chemical Methods:

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Biological Methods:

- Release of egg parasitoid *Trichogramma japonicum* thrice at weekly interval starting 28 days after transplanting @ 2 cc (1 lakh egg parasitoids)/ha/acre followed by the release of *Trichogramma japonicum* at 35 and 42 DAT.
- Apply *Bacillus thuringiensis* var *kurstaki* at 2.5 g/kg to reduce the oviposition by the stem borer.
- Release the egg cards in field during morning hours. Tie the egg cards under the leaf surface facing outside.
- Avoid spraying of chemicals on three days before and upto to seven days after field release of egg cards.

Natural enemies and predators:

Natural enemies:

- Tetrastichus schoenobii* – Wasp
- Telemomonus rowani* – Wasp
- Stenobaron nivicrius* – Braconidae
- Cotesia flavipes* – Braconidae

Predators:

- Lycosa pseudannulata* – Spider predator
- Meteocha vittaticollis* - Cricket

Trap Methods:

- Set up one light trap/ha to attract and kill the moths.
- Set up bird perches to encourage bird predators.
- Use sex pheromone trap for the control of rice stem borer.
- Monitor through pheromone traps (@ 10 to 12/ha) for timely control measures. Change the lure at 10-20 days intervals.

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- Agrocineta pygmaea* – Damselfly

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Advantages and Limitations

- Capture of scarce expertise
- Superior problem solving
- Reliability
- Work with incomplete information
- Transfer of knowledge
- Expertise hard to extract from experts
 - don't know how
 - don't want to tell
 - all do it differently
- Knowledge not always readily available
- Difficult to independently validate expertise
- High development costs
- Only work well in narrow domains
- Can not learn from experience
- Not all problems are suitable

Conclusion

- Helps to overcome shortage of experts in specific knowledge domain
- Saves time of expert, machine answers similar questions by receivers
- Learner should adopt method of learning by doing